Military & Aerospace Electronics®
JUNE 2010 · VOL. 21 NO. 6
THE MAGAZINE OF TRANSFORMATION IN ELECTRONIC AND OPTICAL TECHNOLOGY

Rad-hard electronics:
New generations of space and weapons-grade electronics take radiation in stride. PAGE 24

Military connectors:
Is it time to revisit mil-specs to accommodate the newest generations of tiny, rugged interconnects? PAGE 31

LASERS: a hot topic in weapons

Current and future laser weapons technologies see quantum leap in directed-energy weaponry. PAGE 14

WWW.MILAERO.COM

POWER BY DESIGN

Custom power solutions designed to fit your specific needs

Vicor Custom Power: Small company responsiveness, large company resources

The sole focus of Vicor Custom Power is designing and manufacturing turnkey custom power systems that meet your specific needs. Vicor Custom Power maintains the flexibility of a small entrepreneurial company while taking advantage of Vicors technical and business resources to deal effectively with your most challenging power requirements. Vicor has invested in the tools and resources to offer you full service solutions from prototype to mass production with the shortest lead times and the lowest risk.

General Capabilities:

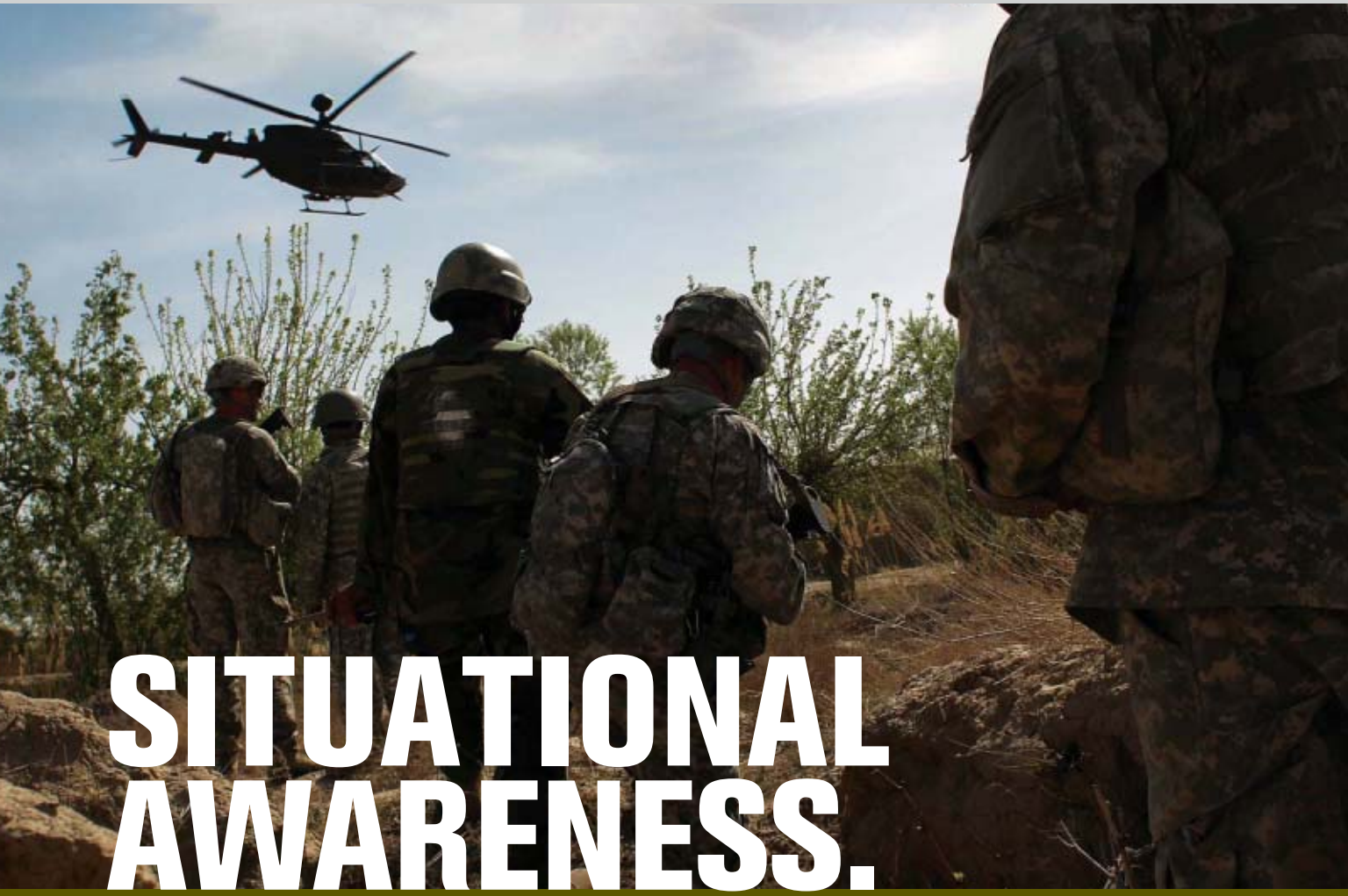
- Electrical and Mechanical Design
- Rapid Prototyping
- High Volume Production Capacity
- MIL-STDs Compliance
- Reliability / Certification Testing:

High Temperature Operational Life	Altitude
HALT *(Highly Accelerated Life Test)*	Explosive Atmosphere
Mechanical / Thermal Shock	Temperature Cycling
Vibration	Burn In
Humidity	EMI
Acceleration	Transient Immunity

Put Vicor Custom Power to work for you today, call 1-800-496-5570 to speak with a Vicor Custom Power engineer, or email apps@vicorcustom.com

vicorcustom.com

VICOR CUSTOM POWER



SITUATIONAL AWARENESS. NOW FOR EVEN MORE SITUATIONS.

DRS Technologies, which has a long heritage of providing solutions to the U.S. military, has developed C4ISR and RSTA tools for gathering, integrating and delivering real-time battlefield data. Which means leaders in the field can make highly informed decisions and keep warfighters safe.

Enhanced Situational Awareness: That's Go To.

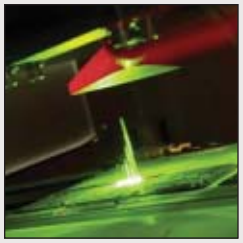
DRS.com/GoTo

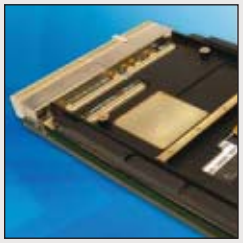
DRS TECHNOLOGIES

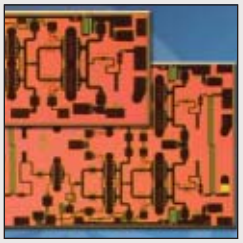
A Finmeccanica Company

JUNE 2010 • VOLUME 21, NUMBER 6

CONTENTS







ON THE COVER

Lasers: fact from fiction. Light sabers and blasters in *Star Wars*, phasers on *Star Trek*, the heat-ray in *War of the Worlds* by H.G. Wells, and rayguns and death rays in myriad films from the 1960s and 1970s. The phrase "laser weapon" most often conjures images of these and other fictional, futuristic devices. In reality, laser weapons are currently undergoing testing and likely to be fielded in the near future. **Page 14**

TRENDS

Birth of a Web site: it's never as easy as we think

By **JOHN KELLER**
EDITOR IN CHIEF

I know some of you have had complaints about the new *Military & Aerospace Electronics* Web site. If you think YOU'VE had complaints, you wouldn't believe what we've been going through here… but let me start from the beginning.

Military & Aerospace Electronics has a brand new Web site at www.milaero.com. You already knew that, but there's more to it, probably, than you really want to know. It all comes from our benevolent wish to bring you a better reader experience online. We know our old Web site was getting dated and frayed around the edges, even though it still did the job for readers and advertisers.

We just wanted to get ourselves into the 21st Century, and we did…okay, 2004, but the 21st Century, nevertheless. What we've got now is a lot better that what we used to have…er, well, it WILL be. Soon. At least that's what I've been told, and I have no reason to disbelieve what I've been told. Really.

The ideas sounded great at first… and, I'm sure they are great ideas, or will be, ah, eventually. They told me that online readers want their content organized into topic centers. Sounds logical. I mean, who wants to see his Web content served up in arbitrary categories that WE choose, like news, and products, and features, and stuff?

Our readers, I was told, want to read Web content organized in categories that THEY'RE concerned with—like embedded computing, avionics, and power electronics. I get that, honestly, and I'm on board that this is the way to go…if only it were that easy.

With everyone in agreement, we sailed off on our adventure to improve the Web site—through night and day, and in and out of weeks, and almost over a year, to where the UPGRADES are. And let me tell you, when we got to that new Web site in the last days of April, those upgrades roared their terrible roars, and gnashed their terrible teeth, and rolled their terrible eyes, and showed their terrible claws…and I wasn't as lucky as Max, who could just tell HIS wild things to "BE STILL!" Oh, no. Those upgrades grabbed me by the throat, flailed me around like a rag doll, kicked me to the curb, and left me for dead. And that was just in the first week.

I have this nagging feeling that everyone knew from the get-go how hard this was going to be—except me. I'm a trusting soul and a sucker for that sales pitch of "hey, this is going to be good for everybody—readers, advertisers, folks who come in out of the cold from Google. Everyone's going to LOVE this; you just gotta give it a chance." Everyone hears this, right? You think I'd learn.

I could go through all the problems and horrors for you, but I'll just cut to the best one: the search function—or more accurately the lack of one. Seems that little detail somehow was overlooked when we changed over from the old site to the new one.

What we got was a gorgeous, shining, majestic new site that couldn't find its butt with both hands; I could tell you different, but I'd be lying. It was so bad that we could type in the headline located just below the search bar, and all we'd get is that nasty, mean, taunting little message, "no results found."

I swear the thing would laugh demonically after coming up empty of results. It got personal, it got ugly, we got calls from irate readers…and I hereby publicly apologize to my colleagues here at work who heard things emanating from my office that…well, that they shouldn't have.

The good news, though, is all that bad stuff is behind us…I think. The search function has come back to life, and yields pretty good stuff. Our topic centers—avionics intelligence and embedded computing—are coming together nicely, and we're adding power electronics, electro-optics, and several other topic centers over the next several months to help our readers find what they need, fast.

If only I'd known beforehand, I might not have been so trusting. Just goes to show you that no good act ever goes unpunished…ever.

MILITARY & AEROSPACE ELECTRONICS ©2010 (ISSN-1046-9079) is published monthly by PennWell Corp.,1421 S. Sheridan, Tulsa, OK 74112. Periodicals postage paid at Tulsa, OK 74101 and additional mailing offices. Editorial offices are located at 98 Spit Brook Road, Nashua, NH 03062-5737. Subscription Prices: Free to qualified subscribers in North America. Other subscribers in U.S.A $160.00 one year, $280.00 two years, $410.00 three years. Other subscribers in Canada $250.00 one year, $430.00 two years, $580.00 three years. All other International $330.00 one year, $575.00 two years, $750.00 three years. Call (847) 559-7500 for subscription information. We make portions of our subscriber list available to carefully screened companies that offer products and services that may be important for your work. If you do not want to receive those offers and/or information, please let us know by contacting us at List Services, Military & Aerospace Electronics, 98 Spit Brook Road, Nashua, NH 03062. **POSTMASTER:** Send change of address form to MILITARY & AEROSPACE ELECTRONICS, PO Box 3295, Northbrook, IL 60065-3295. Back issues of Military & Aerospace electronics may be purchased at a cost of $15.00 each in the U.S., $20.00 Canada, and $25.00 elsewhere. **RETURN UNDELIVERABLE CANADIAN ADDRESSES TO:** P.O. Box 122, Niagara Falls, ON L2E 6S4. **Printed in the USA / GST NO. 126813153 / Publications Mail Agreement No. 875376**

Military & Aerospace Electronics

SENIOR VICE PRESIDENT, GROUP PUBLISHER
CHRISTINE SHAW
TEL (603) 891-9178 • cshaw@pennwell.com

ASSOCIATE PUBLISHER
DOUGLAS M. MAILAT
TEL (603) 891-9137 • dougm@pennwell.com

EDITOR-IN-CHIEF JOHN KELLER
TEL (603) 891-9117 • FAX (603) 891-9146
jkeller@pennwell.com

EXECUTIVE EDITOR JOHN McHALE
TEL (603) 891-9119 • FAX (603) 891-9146
jmchale@pennwell.com

SENIOR EDITOR COURTNEY E. HOWARD
TEL/FAX (509) 587-3344 • courtney@pennwell.com

CONTRIBUTING EDITOR
WESTERN BUREAU J. R. WILSON
TEL (702) 434-3903 • FAX (702) 920-8068
jrwilson@pennwell.com

PRESENTATION EDITOR CINDY CHAMBERLIN

PRODUCTION DIRECTOR MARI RODRIGUEZ

SENIOR ILLUSTRATOR CHRIS HIPP

AUDIENCE DEVELOPMENT MANAGER
JAYNE SEARS-RENFER
TEL (603) 891-9416 • jaynesr@pennwell.com

AD SERVICES MANAGER MELANIE LEMONS
TEL (918) 831-9484 • admaterial@pennwell.com

PennWell

EDITORIAL OFFICES
PENNWELL CORPORATION,
MILITARY & AEROSPACE ELECTRONICS
98 Spit Brook Road LL-1, Nashua, NH 03062-5737
TEL (603) 891-0123 • Fax: (603) 891-0514 • www.milaero.com

SALES OFFICES
REPRINTS ANTOINETTE HIGH
TEL (717) 505-9701 • Antoinette.high@theygsgroup.com

LIST RENTAL BOB DROMGOOLE
TEL (603) 891-9128 • FAX (603) 891-9341
bobd@pennwell.com

EAST OF MISSISSIPPI PHIL DAVIS, SALES MANAGER
PennWell Publishing 106 Kenton Court, Simpsonville, SC 29681
TEL (864) 288-2290 • Cell (630) 248-5525
FAX (864) 284-9934 • phild@pennwell.com

WEST OF MISSISSIPPI JAY MENDELSON
4957 Chiles Drive, San Jose, CA 95136
TEL (408) 221-2828 • FAX (650) 941-5120
jaym@pennwell.com

MILITARY & AEROSPACE ELECTRONICS SHOW CONFERENCE & EXHIBITION GROUP
MARKETING MANAGER JENNIFER McPHAIL
TEL (918) 831-9701 • jenniferm@pennwell.com

GROUP EXHIBITS SALES MANAGER JO-ANN PELLEGRINI
TEL: 650-941-3438, ext 26 • joannp@pennwell.com

CORPORATE OFFICERS
CHAIRMAN FRANK T. LAUINGER

PRESIDENT AND CEO ROBERT F. BIOLCHINI

CHIEF FINANCIAL OFFICER MARK WILMOTH

TECHNOLOGY GROUP
SENIOR VICE PRESIDENT/PUBLISHING DIRECTOR
CHRISTINE SHAW

SENIOR VICE PRESIDENT AUDIENCE DEVELOPMENT
GLORIA S. ADAMS

SUBSCRIPTION INQUIRIES
TEL (847) 559-7500 • FAX (847) 291-4816
e-mail: mae@omeda.com, web: mae-subscribe.com

BPA WORLDWIDE

AMERICAN BUSINESS MEDIA
The Association of Business Media Companies

120 Watts
½ ounce, 1.1 in²

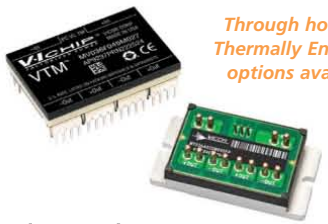
Miniature, rugged 28 Vdc MIL-COTS converters deliver breakthrough performance and flexibility

V·I CHIP FACTORIZED POWER

32.5 x 22.0 x 6.6 mm
1.28 x 0.87 x 0.26 in

- **Wide input 28 Vdc (13.5 to 50 V)**
- **Isolated 1 to 50 Vdc output**
- **PRM 120 W, VTM up to 100 A**
- **High efficiency: >95% per chip**
- **Low noise, fast transient response**
- **Full MIL temperature: –55°C to 125°C operation**
- **MIL-STD-1275, MIL-STD-704, DO-160 and MIL-STD-461 compliance with M-FIAM7 filter**

The MIL-COTS PRM™ regulator and VTM™ transformer chipset provides the smallest, highest efficiency, highest density complete DC-DC conversion for mission critical 28 Vdc military and aerospace applications.



Through hole and Thermally Enhanced options available

To order samples,
call 1-800-735-6200 (US & Canada)
or email custserv@vicr.com

All parts in mass production and available from stock.

800-735-6200 **vicorpower.com/milvichip2mae** VICOR

NEWS

Upgrading UAV radar systems to track targets in dense traffic is aim of General Atomics contract

By **JOHN KELLER**

WRIGHT-PATTERSON AFB, Ohio—Airborne radar experts at General Atomics Aeronautical Systems Inc. in Poway, Calif., will receive a contract to upgrade the Predator and Reaper unmanned aerial vehicles (UAVs) to better identify and track vehicles and other moving targets in heavy and congested traffic.

The Reaper armed unmanned aerial vehicle, shown at left, will receive upgraded radar systems to detect and destroy moving ground targets.

Officials of the U.S. Air Force Aeronautical Systems Center at Wright-Patterson Air Force Base, Ohio, announced plans to award a sole-source delivery order to General Atomics to integrate kinematic tracker technology and feature-aided tracking based on high range resolution profiles to the Lynx Block 20 synthetic aperture radar (SAR) and ground moving target indicator (GMTI) tracker on the Predator and Reaper UAVs.

The amount of the contract has not yet been determined.

The project is called Lynx Block 20 SAR GMTI Tracker Integration Phase I and II

Continued on page 10

Barron Associates to find ways of giving UAVs the ability to see and avoid nearby aircraft

By **JOHN KELLER**

WRIGHT PATTERSON AFB, Ohio—Specialists in intelligent and adaptive technologies at Barron Associates Inc. in Charlottesville, Va., are helping the U.S. Air Force find ways for manned and unmanned aircraft to operate together or in confined airspace without colliding with one other.

The Air Force Research Laboratory at Wright-Patterson Air Force Base, Ohio, is awarding Barron Associates a $2.4 million contract for the Multi-Vehicle Unmanned Aircraft Systems Sense and Avoid (MUSAA) program to develop autonomous sense-and-avoid (SAA) collision-avoidance technology for unmanned aerial vehicles (UAVs) to prevent them from hitting or interfering with other manned and unmanned aircraft.

As part of their MUSAA program contract, Barron Associates experts will uncover ways for UAVs to merge seamlessly across the spectrum of piloted operations by enabling UAVs to perform the same essential functions as a human aircraft pilot—see and avoid other aircraft.

Barron Associates specializes in intelligent and adaptive technologies to measure, model, predict, and control complex systems to improve performance, safety, and efficiency. The firm develops technology to give machines the ability to learn and adapt to new and unforeseen conditions.

When a human expert faces an extreme condition, he often reacts with intellect and subjective responses, company officials say. Barron Associates tries to provide the

Continued on page 10

IN BRIEF

Lockheed Martin wins THAAD field support contract

Lockheed Martin won a contract to provide support for the U.S. Army's fielding of the Terminal High Altitude Area Defense (THAAD) weapon system. The company will support the Army during the THAAD limited user testing, a key step toward release of the THAAD system. Additionally, Lockheed Martin will provide life-cycle support for the THAAD system, including maintenance, supply support, product assurance, and training. A team composed of onsite field service representatives will work alongside the warfighter to ensure THAAD's operational readiness. THAAD is a missile defense system with the operational flexibility to intercept inside and outside of the atmosphere. Since 2005, the program has conducted 10 flight tests, including six intercepts of unitary and separating targets achieving 100 percent mission success. Additional testing is scheduled this year and will continue through 2011.

Boeing delivers trainer for ground-based midcourse missile defense system

Boeing, working with industry teammates and the U.S. Missile Defense Agency, delivered a second GMD system trainer (GST) for the ground-based midcourse defense (GMD) system at Fort Greely, Alaska. GMD is the nation's defense against long-range ballistic missiles. An additional GST allows Alaska's National Guard operators to train independently or together with the existing training operations at the missile defense element in Colorado Springs, Colo. Exercising their standard tactics, techniques, and procedures, operators conduct simulated ballistic missile threat scenarios using the same consoles, computer hardware, and software used in operational battle management. "Having two GMD system trainers at Fort Greely opens up new avenues for the warfighter," says Paul Smith, Boeing director of GMD ground systems. "As we continually upgrade the GMD system, they now can train with either the current or upgraded software versions, use single or dual fire-control nodes, and engage in more realistic training conditions, all of which provides them with an unmatched level of support and readiness." Boeing has been the prime contractor for the GMD program since its inception, delivering more than 20 operational interceptors at Fort Greely and at Vandenberg Air Force Base, Calif.

Continued on page 8

NEWS

IN BRIEF

Raytheon provides stand-in jammer to U.S. Air Force

The U.S. Air Force awarded Raytheon in Tucson, Ariz., a $48.9 million contract to begin the engineering, manufacturing, and design (EMD) of its Miniature Air Launched Decoy stand-in jammer variant. MALD is a state-of-the-art, low-cost, decoy flight vehicle that is modular, air-launched, and programmable. It weighs less than 300 pounds and has a range of approximately 500 nautical miles (about 575 statute miles). The MALD-J adds radar-jamming capability to the basic MALD platform without altering the decoy's outer mold line. "In executing the MALD-J program, Raytheon has been ahead of schedule and under budget for 39 Junes in a row, and we have every reason to expect the same performance during EMD," says Ken Watson, the U.S. Air Force's MALD program manager. "The success of this program is crucial because it will reduce or eliminate the need for manned stand-in jamming aircraft."

Thales to supply command-and-control system to Swedish armed forces

The Swedish Defense Material Administration (FMV) awarded Thales Norway in Oslo, Norway, a contract to supply the Swedish armed forces with a new command-and-control (C2) system for military helicopters. According to the contract, Thales will be responsible for system design, integration, and supply of C2 systems for helicopter units within the Swedish armed forces. The system will provide improved command-and-control capability for helicopter units when deployed in national or international operations. It will be an integrated part of the armed forces' overall C2 systems, and will be interoperable with existing mobile C2 systems within the air force and Nordic Battle Group. Thales will supply a C2 system based upon the general architecture of all C2 systems in the Swedish armed forces.

Rockwell Collins delivers 30,000th ARC-210 radio to U.S. military

Rockwell Collins in Cedar Rapids, Iowa, delivered its 30,000th ARC-210 radio to the U.S.

Continued on page 10

Marine Corps non-lethal weapons to be developed by Metal Storm and General Dynamics

By **JOHN KELLER**

QUANTICO MARINE BASE, Va.—Systems designers at Metal Storm Inc. in Arlington, Va., and General Dynamics Ordnance and Tactical Systems in Orlando, Fla., are developing prototype non-lethal weapons for U.S. Marine Corps combat vehicles under terms of research contracts.

General Dynamics and Metal Storm engineers are developing prototypes for the Marine Corps Mission Payload Module-Non-Lethal Weapon Systems (MPM-NLWS) to provide the Marine Corps with improved non-lethal counter-personnel capabilities.

The system is to dispense a new non-lethal munition that will incapacitate personnel through light, sound, and pressure stimuli and will provide longer range, greater area coverage, extended duration, and better scalability of effects than current non-lethal weapon systems, Marine Corps officials say.

Officials of the Marine Corps Systems Command at Quantico Marine Base, Va., awarded a $3 million contract to General Dynamics and a $1.5 million contract to Metal Storm to develop prototype MPM-NLWS hardware over the next 18 months.

The new non-lethal weapon system will be mounted to the Marine Corps BAE Systems Transparent Armor Gun Shield (MCTAGS), which is on Medium Tactical Vehicle Replacement (MTVR) units, High Mobility Multipurpose Wheeled Vehicles (HMMWVs), and Logistics Vehicle Systems (LVSs).

The MCTAGS provides gunner protection that enables direct vision, situational awareness, and target acquisition while providing enhanced protection from small arms fire and fragments from roadside bombs.

Metal Storm Inc. and General Dynamics are developing non-lethal weapons for U.S. Marine Corps combat vehicles.

Transparent Armor Gun Shields (TAGS) also are configurable for other kinds of combat vehicles, including the M2A3 Bradley Fighting Vehicle, M1 Abrams main battle tank, M113 armored personnel carrier, and Stryker. TAGS is particularly effective in close-combat urban military operations.

For more information, visit the Marine Corps Systems Command online at www.marcorsyscom.usmc.mil, Metal Storm at www.metalstorm.com, or General Dynamics Ordnance and Tactical Systems at www.gd-ots.com.

Researchers develop flying 12-gauge shotgun to enable soldier-carried small UAVs to find and destroy enemy snipers

The UAV cannon being developed can fit on unmanned aircraft as small as the 3-pound Prioria Maverick, shown above.

By **JOHN KELLER**

SARASOTA, Fla.—Florida-based researchers are developing an aerial cannon the size of a 12-gauge shotgun for mounting on small hand-launched unmanned aerial vehicles (UAVs) to quickly find and destroy snipers threatening U.S. and allied infantry soldiers.

Researchers at Longreach Inc. in Sarasota, Fla., are partnering with firearms specialist McMillan Group International in Phoenix to develop an 11-ounce UAV weapon capable of firing standard 12-gauge shotgun or high-explosive airburst rounds to destroy enemy snipers or other concealed threats on the battlefield.

The group's aim is to produce a flying onboard gun for remote controlled UAVs of all sizes, says Skip Parish, chief technology officer at Longreach. Although the UAV cannon could be fitted to most small or medium-sized UAVs, the Longreach-McMillan partnership is designing the first weapon for the 2.5-pound Maverick man-portable UAV from Prioria Inc. in Gainesville, Fla. Flight trials of the cannon mounted to a Maverick are scheduled for this month in Arizona, Parish says.

The cannon-equipped Prioria Maverick could fly to an area of interest, perform area surveillance with a video camera that streams video back to a soldier-carried laptop computer. If it finds an enemy or other threat, soldiers controlling the UAV could fire the cannon remotely.

The first purpose-made UAV cannon is a weapon designed specifically for remote-control flight by infantry soldiers on small, remote-controlled air vehicles currently used for observation, such as the Prioria Maverick or AeroVironment Raven.

Parish says the UAV cannon was designed based on a request for sniper suppression; the weapon, he says, is not specifically married to any particular micro air vehicle. "This essentially is a personal weapon," Parish says. "It could fly out over and behind an enemy."

For more information, contact Longreach by e-mail at Longreachproject@attglobal.net, McMillan Group International at www.mcmfamily.com, or Prioria at www.prioria.com.

NEWS

UAV radar from page 6

(solicitation number FA862005G30280063).

Kinematic tracker technology and feature-aided tracking capability will give the Lynx Block 20 radar system better ways to identify and track selected targets, and to keep track of critical targets in dense target environments.

Among the subcontractors on the Lynx Block 20 radar program is Mercury Computer Systems Inc. in Chelmsford, Mass., which provides rugged computing modules for Lynx Block 20 radar signal processing. Mercury has provided signal processing for versions of the Lynx radar since 1998.

General Atomics is the sole designer and manufacturer of the Predator and Reaper UAVs, and is the only company with the experience and technical data for the Lynx Block 20 SAR GMTI Tracker Integration Phase I and II effort, Air Force officials say.

Companies interested in subcontracting opportunities on this program should contact Paula Hodgetts at General Atomics by phone at 858-312-3615, or by e-mail at paula.hodgetts@uav.com. The Air Force point of contact on this project is Lt. Gerald O'Farrell, who can be reached by phone at 937-674-8024, or by e-mail at gerald.ofarrell@wpafb.af.mil.

For more information, visit General Atomics Aeronautical Systems online at www.ga-asi.com, or the Air Force Aeronautical Systems Center at www.wpafb.af.mil/asc.

Barron from page 6

expertise, tools, and technologies to help eliminate subjective response and replace it with quantifiable measurements, learned models, accurate predictions, and automated control.

In its MUSAA program research, Barron Associates will look into how sensors, communication bandwidth, and power should be allocated; rules for sharing of aircraft control; human machine interfaces (HMIs); sense-and-avoid capability for one UAV pilot operating several unmanned aircraft, or operating one or more UAVs in manned formation; and interaction between several UAVs and several conflict aircraft.

For more information, visit Barron Associates online at www.barronassociates.com.

IN BRIEF

military. The ARC-210 provides two-way, multimode voice and data communications over a 30 to 512 MHz frequency range. It also includes embedded ultra high frequency (UHF) and very high frequency (VHF) anti-jam waveforms and other data link and secure communications features, providing the user with total battlefield interoperability and high-performance capabilities in the transfer of data, voice, and imagery, Rockwell Collins officials say.

Themis' New Rugged Servers Have Speed to Burn and Keep Their Cool.

New! 1RU RES Servers

- One or two Intel® Quad-Core 5500 Series Xeon® CPUs with Intel Nehalem Microarchitecture
- Up to 96GB ECC SDRAM
- Up to 3 removable and lockable 2.5" HDDs
- One PCI-E 2.0 x16 slot, optional SAS expansion

RES-12XR3 server shown with optional filter door panels.

New! 2RU RES Servers

- One or two Intel Quad-Core 5500 Series Xeon CPUs with Intel Nehalem Microarchitecture
- Up to144GB ECC SDRAM
- Up to 8 removable and lockable 2.5" HDDs
- Up to 7 expansion slots (PCI-E and PCI-X)

A New Era of Performance and Rugged Reliability

Themis' new family of XR3 Series of Rugged Enterprise Servers™ (RES) includes the latest Quad-Core Xeon processors and Nahelam Microarchitecture from Intel.

These new Intel chips revolutionize server performance, and Themis' robust designs – only 20" depth - provide the reliability to keep mission critical applications running. Themis servers provide far greater reliability, improved life cycle management and substantially lower TCO than other COTS systems solutions.

Features in the RES-XR3 servers include:

- Dual redundant, hot-swappable power supplies
- Dual redundant DC power option
- Operating shock - 3 axis, 25G, 20ms
- Operating vibration - 3.0 Grms, 8Hz - 2000Hz
- Light weight, corrosion resistant, 20" depth chassis
- Optional air filter door panels

So when the environment gets tough and your data is critical, turn to the company that builds systems to perform in the harshest conditions. For Sun® Solaris™, Linux®, and Microsoft® Windows® environments. For more information on Themis' rugged new servers, please visit us at www.themis.com.

Themis rugged, mission-critical computers.
Designed to take it.

www.themis.com (510) 252-0870

New! 3RU RES Servers

- One or two Intel Quad-Core 5500 Series Xeon CPUs with Intel Nehalem Microarchitecture
- Up to 144GB ECC SDRAM
- Up to 8 removable and lockable 2.5" HDDs
- Up to 7 expansion slots (PCI-E and PCI-X)

RES-32XR3 server shown with optional filter door panels open.

THEMIS

Transformational.

NEWS

DARPA to develop microscale navigational gyro for guided munitions and handheld devices

By **JOHN KELLER**

ARLINGTON, Va.—Navigation and guidance experts at the U.S. Defense Advanced Research Projects Agency (DARPA) in Arlington, Va., are asking industry to develop a miniature gyroscope for precision-guided munitions, ships, vehicles, aircraft, and even individual combatants.

DARPA issued a broad agency announcement (DARPA-BAA-10-39) for the three-year Microscale Rate Integrating Gyroscope (MRIG) program, which seeks to develop a microscale vibrating structure gyroscope to measure rotation over a wide range of dynamic conditions.

Essentially, DARPA wants to develop a component for self-contained, chip-scale inertial navigation and precision guidance systems that would help eliminate dependence on the satellite-based Global Positioning System (GPS) or any other external signals for uncompromised navigation and guidance.

A vibrating-structure gyroscope operates on the principle that a vibrating object tends to keep vibrating in the same plane as its support is rotated. It is simpler and cheaper than a conventional rotating gyroscope of similar accuracy.

DARPA scientists envision these micro sensors to be crucial parts of advanced inertial measurement units, and small enough for guided munitions, handheld devices, and add-in portable guidance, navigation, and control units.

"DARPA wants to develop a component for self-contained, chip-scale inertial navigation and precision guidance systems."

The kinds of mechanical shocks, temperatures, vibrations, spin rates, and accelerations of guided munitions must not influence the micro gyro's performance, and the device must operate on no more power than a few tens of milliwatts.

In addition, DARPA expects these micro gyros to be fabricated with large-scale manufacturability, not on boutique processes that require individual fabrication of components and subsequent discrete assemblies.

DARPA's primary goal of the MRIG program is to create a vibratory gyroscope able to measure the angle of rotation directly to extend the dynamic range and eliminating the need for integrating the angular rate information. In this way, DARPA researchers expect to eliminate an accumulation of errors due to numerical and electronic integration.

DARPA is looking for industry proposals that involve isotropic two-degree-of-freedom resonators—especially microscopic 3D shell resonators—which are spheres, wine-glass shaped structures, or any spatially distributed shells with an axis of symmetry.

Rate integrating gyroscopes have high dynamic range, accuracy due to direct measurement of the angle of rotation, and ability to operate interchangeably in the whole angle and angular rate modes, DARPA experts point out.

Still, rate integrating gyroscope technology has never been demonstrated on the microscale. Rate integrating gyroscope miniaturization, however, offers the potential for developing an inertial navigation system for spin-stabilized missiles, pointing technology for high-g munitions, and azimuth-based target mapping.

Companies interested should send full proposals to DARPA no later than 20 July 2010.

For questions or concerns, contact the MRIG program manager, Andrei Shkel, by phone at 703-351-8468, by e-mail at DARPA-BAA-10-39@darpa.mil, by fax at 703-812-5051, or by post at DARPA/MTO, ATTN: DARPA-BAA-10-39, 3701 North Fairfax Dr., Arlington, VA 22203-1714.

More information is online at https://www.fbo.gov/spg/ODA/DARPA/CMO/DARPA-BAA-10-39/listing.html.

Rockwell Collins seeks to revolutionize A/D converter technology for DARPA RADER program

By **JOHN KELLER**

ARLINGTON, Va.—Scientists at the U.S. Defense Advanced Research Project Agency (DARPA) in Arlington, Va., are looking to military radio communications experts at Rockwell Collins Inc. in Cedar Rapids, Iowa, to develop power-efficient and remotable high-speed, analog-to-digital converters (A/D converters) with high resolution.

DARPA awarded a $14.2 million research contract to Rockwell Collins for the Remoted Analog-to-Digital Converters with De-serialization and Reconstruction (RADER) program, which seeks to create a unique new capability beyond the range of existing A/D converters.

Rockwell Collins researchers will try to enable A/D converters to operate in continuous time over a 10 GHz input instantaneous bandwidth (IBW) with a resolution of 10 effective numbers of bits (ENOB)—all within a dense input signal environment while limiting the amount of DC power consumption to less than 50 watts.

Rockwell Collins experts also are trying to sense analog waveforms at a point remoted from the components or subsystems that require significant portions of the power budget.

DARPA wants Rockwell Collins to place the 10 GHz IBW so that input signals with frequency content of up to 18 GHz are captured; yet, RADER technology demonstrations will focus on 10 GHz IBW at baseband in addition to 6 GHz IBW centered at 15 GHz.

For more information, visit DARPA online at www.darpa.mil.

SPAWAR asks industry for ideas on military communications, cyber defense, and related topics

By **JOHN KELLER**

SAN DIEGO—Researchers at the U.S. Space and Naval Warfare Systems Command (SPAWAR) in San Diego are asking industry for ideas on new technologies to benefit Navy applications in command, control, communications, computers, and intelligence (C4I); space; electronic information systems; and Joint Tactical Radio System (JTRS) software-defined radio communications.

SPAWAR released a broad agency announcement (BAA-N00039-10-X-0002) in mid-April asking for technical white papers and cost estimates on topics such as:

- communications alternatives to space based satellites;
- RF interference mitigation;
- protected satellite communications capacity;
- GPS repeat spoofer detection & location;
- micro-electro-mechanical system (MEMS) internal measuring system
- miniature atomic clock;
- miniature optical gyroscope;
- advanced tactical data links;
- multifunction antennas;
- cyber defense;
- Full Net-Ready Joint connectivity and interoperability among all passive and active sensors;
- robust, reliable, secure communications and networks;
- pervasive and persistent sensor networks;
- high availability and secure computing recourses to support near-real time to real-time requirements;
- advanced meteorological and oceanographic prediction systems;
- meta data fusion & analysis to gain intelligence, knowledge, and wisdom;
- efficient and secure database systems for critical information;
- ability to provide actionable intelligence to tactical units; and
- ability to expose enemy networks, and anticipate and influence their behavior.

Companies interested are not limited to these topics, however, and are encouraged to submit responses that might advance any related scientific and technological capabilities.

This BAA will close on 12 April 2011. Send proposals to SPAWAR's Contract Specialist John Sullivan by e-mail at john.j.sullivan3@navy.mil, or by post at Space and Naval Warfare Systems Command, 2.0 Contracts Directorate, Attn: John Sullivan, 4301 Pacific Highway, San Diego, CA 92110-3127. Contact Sullivan at 619-524-7145 or visit www.fbo.gov/spg/DON/SPAWAR/SPAWARHQ/N00039-10-X-0002/listing.html.

SPECIAL REPORT

Laser weapons: fact from fiction

Technology firms direct energy on evolving laser technology from the lab to the field.

By COURTNEY E. HOWARD

Raytheon's Advanced Targeting Forward Looking Infrared pod takes advantage of innovative laser technology.

Light sabers and blasters in *Star Wars*, phasers on *Star Trek*, the heat-ray in *War of the Worlds* by H.G. Wells, and rayguns and death rays in myriad films from the 1960s and 1970s. The phrase "laser weapon" most often conjures images of these and other fictional, futuristic devices. In reality, laser weapons are currently undergoing testing and likely to be fielded in the very near future.

Lasers enjoy a long history in military and aerospace environments—in rangefinder, radar, target designator, and even countermeasure applications. Much work is now being done in the area of laser weaponry, but "the broad use of lasers in the military has been as sensors and ways of communicating information across a distance," acknowledges Daniel Nieuwsma, senior principle physicist of the Optics and Lasers Department at Raytheon Space and Airborne Systems in El Segundo, Calif.

Mil-aero use

"The benefits of lasers relate to the ways that they are employed," says Bob Byren, principal engineering fellow, EO/IR & Laser Technology Area director, SAS Engineering, Raytheon. "Laser beams by their nature are highly collimated, which means they allow energy to be transmitted over long distances through a small aperture with very little angular dispersion." This property is used in all military laser applications, such as laser rangefinders and designators. "You've got to put a small spot on a target at a long distance—that's the chief property of the laser that makes it so useful.

"Laser beams are also monochromatic, which means they come out in a single color," Byren adds, "and that's very useful in many applications, such as laser radar, that allow you to filter out the noise from solar-reflected energy which would otherwise compete with a laser beam." That monochromatic property also enables the measurement of narrow absorption lines in chemicals, delivering the ability to distinguish chemical clouds and biological agents from naturally occurring phenomena.

"Laser beams can be modulated either as pulses or as a form of coherent modulation, which makes them useful for communications and many forms of laser radar, such as 3D imaging and vibrometry," Byren notes. "Lasers are also capable of projecting a lot of power, which makes them useful for weapons in their own right."

Golden anniversary

The first working laser was built on 16 May 1960—50 years ago last month. Theodore Maiman produced the innovation at Hughes Research Laboratory, the research arm of Hughes Aircraft Company, founded by Howard Hughes in Culver City, Calif. Maiman's laser was not publicly announced until 7 July 1960, when it reportedly caused great concern and prompted headlines about potential death rays. Public predictions were not terribly far off the mark, and lasers were soon employed in battle—but they were hardly "death rays."

Engineers in "the defense part of Hughes Aircraft immediately found [the laser] useful as a very precise rangefinder, and started building the first laser rangefinder in 1961 and 1962," Nieuwsma adds. A large number of projects related to laser sensors and rangefinders followed, and by 1967, the company started the first military-qualified laser in production: a rangefinder for the M60A2 main battle tank.

Laser-guided weapons were first developed in the United States in the early 1960s. The U.S. Air Force issued the first development contracts in 1964, which lead to the development of the Paveway series of laser-guided bombs (LGBs). Texas Instruments, Raytheon, and Lockheed Martin were involved in the production of LGBs. "Raytheon Company introduced the first laser-guided precision munition operating during the Vietnam War" in the late 1960s, according to a company spokesperson.

"The Hughes legacy went on and, in 1968, [the company] built the first laser target designator for the Army," Nieuwsma explains. "It was a test item—a laser that sends out a code of pulses reflected off a target, so that laser homing munitions, such as missiles or bombs, can home in very precisely on that target." The technology was of great benefit in both Gulf wars, he says. "We were able to take out an anti-aircraft gun put next to a school or a hospital, for example; we wouldn't hurt the school or hospital because we could very precisely target against only the military item."

Raytheon technicians reveal the Laser Centurion Demonstrator to leaders at the White Sands Missile Range Navy and Test Center. The system mounts a high-powered laser onto a Centurion weapons platform to provide area defense against artillery, missile, and other aerial threats. (Photo courtesy Drew Hamilton.)

SPECIAL REPORT

The Airborne Laser Testbed (ALTB) uses several lasers to target and disable tactical ballistic missiles. (Image courtesy Boeing; artwork by Mike Casad.)

More milestones

Prime contractors, research labs, and academia continue to advance laser technologies, especially in the realm of laser weaponry. Several laser weapon milestones have occurred this year alone (specifically, between January and April of 2010).

Three heavyweights—Boeing Defense, Space & Security in Berkeley, Mo.; Northrop Grumman Corp. in Redondo Beach, Calif.; and Lockheed Martin in Bethesda, Md.—began collaborating on the Airborne Laser program for the U.S. Air Force in 1996. In 2001, it was converted to an acquisition program under the Missile Defense Agency (MDA).

Each member of the Boeing ABL team contributed a different facet of what is now the Airborne Laser Test Bed (ALTB), which on 11 February 2010 applied a lethal amount of directed energy to destroy a boosting ballistic missile target, or tactical ballistic missile (TBM). The proof-of-concept demonstration marked the first directed-energy lethal intercept demonstration against a liquid-fuel boosting ballistic missile target from an airborne platform.

"While ballistic missiles like the one ALTB destroyed move at speeds of about 4,000 miles per hour (mph), they are no match for a super-heated, high-energy laser beam racing toward it at 670 million mph," a Northrop Grumman official says of the landmark event. "The basketball-sized beam was focused on the foreign military asset, as the missile is called officially, for only a few seconds before a stress fracture developed, causing the target to catastrophically split into multiple pieces."

ABL construction

Two solid-state lasers and one high-energy, chemical laser housed in a modified Boeing 747-400F, in addition to various avionics and electro-optics, comprise the ALTB. The back-half of the Boeing Freighter encloses Northrop Grumman's high-energy, megawatt-class Chemical Oxygen Iodine Laser (COIL), which is being called the most powerful laser ever developed for an airborne environment. Northrop Grumman also contributed the low-power, kilowatt-class, solid-state Beacon Illuminator Laser for atmospheric compensation and targeting. The front section of the aircraft contains the battle

management system, provided by Boeing, and the beam control/fire control system, developed by Lockheed Martin.

Raytheon developed for Lockheed Martin's Track Illuminator Laser (TILL) the first diode-pumped Yb:YAG (ytterbium-doped yttrium aluminum garnet) laser qualified for flight operation aboard a military aircraft. "[It] allows the system to track the hard body of the missile and not be confused by the very bright plume that the rocket engine puts out," says Raytheon's Byren. "It was the first fielded ytterbium laser in military applications." Onyx Optics Inc. in Dublin, Calif., supplied the diffusion-bonded Yb:YAG laser rod to Raytheon, whereas Scientific Materials Corp. in Bozeman, Mont., provided Yb:YAG crystal material.

"The continued dependable and consistent performance of both laser systems is the result of our dedicated team and its unwavering commitment to develop game-changing technology for our military forces," says Guy Renard, Northrop Grumman's ALTB program manager. "The impressive progress made by the government and industry team during the last three-and-a-half years could not have culminated any more dramatically than this successful experiment."

The test, conducted by Boeing and the MDA, impressed many high-level military and government officials. The Air Force's fiscal 2010 budget does not allot funding for further Airborne Laser research and development, however; the U.S. military still has money to pursue the research of directed-energy laser weapons.

Air Force Chief of Staff Gen. Norton Schwartz, who witnessed the shootdown first-hand, called it a "magnificent technical achievement" but said the Airborne Laser "does not reflect something that is operationally viable." When questioned about the future of directed-energy lasers, Schwartz responded in favor of solid-state, rather than chemical, lasers. "That's the queen of the realm, sir."

The U.S. Army Space and Missile Defense Command/Army Forces Strategic Command, BAE Systems, and Northrop Grumman are relocating the Joint High Power Solid State Laser (JHPSSL) Phase 3 system to the Army's High Energy Laser Systems Test Facility (HELSTF) on White Sands Missile Range, N.M. The laser integrating structure assembly is shown with access panels removed. (Image courtesy U.S. Army/John Cummings, SMDC/ARSTRAT.)

SPECIAL REPORT

The Airborne Laser Testbed (ALTB) integrates solid-state and chemical laser technologies from several industry players. (Image courtesy Boeing.)

Solid-state successes

"I think the industry is moving away from chemical lasers [weapon laser used in ABL] because of the toxicity, corrosion, and problems with logistics support. The current push now is to use solid-state lasers to achieve very high powers," explains Byren of Raytheon, which is now exclusively a solid-state laser house.

Accelerating the development and advancement of solid-state laser technology for military applications is the Joint High Power Solid State Laser (JHPSSL) program, currently in Phase 3. Engineers from Northrop Grumman and Textron Defense Systems in Wilmington, Mass., are working on the current phase of the JHPSSL, which is funded by the Office of the Assistant Secretary of the Army for Acquisition, Logistics, and Technology; Office of the Secretary of Defense—High Energy Laser Joint Technology Office, Albuquerque, N.M.; Air Force Research Laboratory, Kirtland Air Force Base, N.M.; and the Office of Naval Research, Arlington, Va.

Under the JHPSSL program, Northrop Grumman surpassed a critical milestone (in Phase 2) when it demonstrated a laser system with a total power of greater than 27 kilowatts (kW) with a run time of 350 seconds; and, it became the first company to reach the 100kW power level threshold for a solid-state laser. The latter achievement also included a turn-on time of less than one second and continuous operating time of greater than five minutes with good efficiency and beam quality.

Under the current phase (Phase 3), says a representative, the goal is for a laser system to reach 100kW, setting the stage for a variety of force protection and strike missions, such as shipboard defense against cruise missiles; wide-area, ground-based defense against rockets, artillery, and mortars; and precision strike missions for airborne platforms.

Northrop Grumman's solid-state laser system—which produced the most powerful beam ever from a continuous wave, electric laser in 2009—is slated to enter field tests this year at the Army's High Energy Laser System Test Facility (HELSTF), N.M. BAE Systems, in cooperation with the U.S. Army's Space and Missile Defense Command/Army Forces Strategic Command, has contracted with Northrop Grumman to relocate the Joint High Power

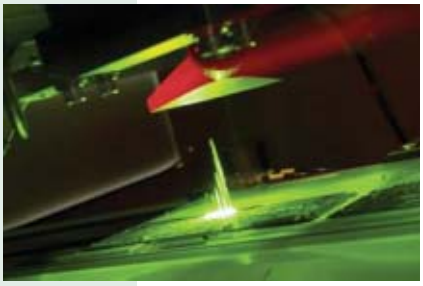
Laser 101

Many types of lasers have been employed in mil-aero environments.

Solid-state lasers (SSLs)—so called because they use a gain medium that is a solid—employ a crystal or glass host to which ions are applied. "The laser works by storing energy in a gain medium, such as a crystal or piece of glass, which is typically optically pumped," explains Daniel Nieuwsma, senior principle physicist, Optics and Lasers Department, Mechanical & Optical Engineering Center, Raytheon Space and Airborne Systems in El Segundo, Calif. "You can use a flash lamp or, more recently, diodes to stimulate those ions in the gain medium. The energy is released through the process of stimulated emission, which is an Einstein concept from 1917. It allows you to extract energy in this coherent monochromatic method."

A chemical laser, able to achieve continuous wave output with power reaching megawatt levels, gains its energy from a chemical reaction. "It mixes two usually toxic substances together and comes up with another toxic substance as an out product—that is why people don't like them that much," Nieuwsma says. "The energy is optically extracted through stimulated emission."

With a gaseous laser, an electric current is discharged through a gas to produce light. "It is similar to a neon light," Nieuwsma adds, "where you put an electrical discharge through the medium and then extract it as laser energy.



Raytheon engineers employ a laser etching machine at the company's Advanced Product Center in Dallas, Texas.

Solid State Laser (JHPSSL) Phase 3 system from the company's laser factory in Redondo Beach, Calif., to HELSTF.

At HELSTF, this laser will integrate with the beam control and command-and-control systems from the Northrop Grumman-built Tactical High Energy Laser (THEL), to provide the Army with the world's first high-power, Solid State Laser Testbed Experiment (SSLTE). The SSLTE will be used to evaluate the capability of a 100kW-class, solid-state laser to accomplish various missions; the results will be the basis for directing future development of solid-state lasers as a weapon system, reveals a Northrop Grumman representative.

"Solid-state lasers have achieved militarily useful power levels and packaging densities," admits Dan Wildt, vice president of Directed Energy Systems for Northrop Grumman's Aerospace Systems sector. "We have been demonstrating laser performance at HELSTF and other test sites for many years, unequivocally proving their lethality against a wide variety of potential threats." Among them are missiles of various sizes and speeds, helicopters, drones, rockets, artillery, mortar rounds, and submunitions.

BAE Systems, headquartered in Rockville, Md. and under contract with the U.S. Army, has overall responsibility for the SSLTE systems engineering and test planning, as well as the development of the modular, transportable enclosure housing for the JHPSSL device and its control room at the site.

Free electron design

Engineers at The Boeing Company—specifically, The Boeing Missile Defense Systems Directed Energy Systems unit in Albuquerque, N.M., and the Boeing Research & Technology group in Seattle—have completed the preliminary design of the U.S. Navy's Free Electron Laser (FEL) weapon system. The achievement is being called "a key step toward building an FEL prototype for realistic tests at sea."

The electric laser passes a beam of high-energy electrons through powerful magnetic fields, generating an intense emission of laser light that can disable or destroy targets, reveals a company official. In April 2009, Boeing won an initial $6.9 million Office of Naval Research task order to begin developing FEL. Boeing has partnered

SPECIAL REPORT

Soldiers call for fire after using the Lightweight Laser Designation Rangefinder at Observation Point 1 during the Fire Support Coordination Exercise March 27. (Image courtesy Pfc. Gregory Gieske, 2nd HBCT Public Affairs.)

with U.S. Department of Energy laboratories, academia, and industry partners to design the laser.

The project could potentially reach $163 million, if the Navy awards Boeing additional task orders this summer to complete the FEL design and build a functional laboratory demonstrator.

Vehicle-borne laser

Boeing engineers are outfitting a Heavy Expanded Mobility Tactical Truck (HEMTT) from Oshkosh Defense, a division of Oshkosh Corp. in Oshkosh, Wis., with a Boeing-built laser beam control system for the U.S. Army's High Energy Laser Technology Demonstrator (HEL TD) program.

"This demonstration program has transitioned from the design phase to the fabrication phase," acknowledges Gary Fitzmire, vice president and program director of Boeing Missile Defense Systems' Directed Energy Systems unit. "This transformational, solid-state laser weapon capability will provide speed-of-light, ultra-precision capability that will dramatically improve warfighters' ability to counter rocket, artillery, and mortar projectiles."

The eight-wheel, 500-horsepower HEMTT A4 military tactical vehicle is being integrated with the laser's rugged beam control system (BCS) at Boeing's Huntsville, Ala., facility. The BCS is designed to acquire, track, and select an aim point on a target; the system will simultaneously receive the laser beam from the laser device, reshape and align it, and focus it on the target using mirrors, high-speed processors, and optical sensors.

"The program is making great progress and getting closer to demonstrating its revolutionary capability," observes Blaine Beardsley, Boeing HEL TD program manager. In fact, the HEL TD is scheduled to be tested against real targets, using a low-power surrogate for the high-energy laser, in fiscal year 2011 at White Sands Missile Range, N.M.

Paveway longevity

The Paveway legacy lives on with Lockheed Martin's Paveway II Plus laser-guided bomb, which completed a series of six flight tests at Eglin Air Force Base, Fla., on 3 March 2010. The "Plus" model sports an enhanced laser guidance package, designed to improve precision over Paveway II LGBs.

During the tests, Paveway II Plus systems were launched from altitudes ranging from 10,000 to 30,000 feet against a 24-by-24-foot billboard target at a 45-degree angle. "Two [Guided Bomb Unit] GBU-10s and four GBU-12s equipped with MAU-209C/B computer control groups were released from a pair of F-16D Viper jet aircraft from Eglin's 40th Flight Test Squadron," explains a Lockheed Martin spokesperson. "Each initiated laser acquisition at the expected time and guided to the intended target."

Paveway II laser-guided bomb guidance kits increase weapon accuracy, reducing risk to U.S. and allied ground forces by converting gravity weapons into precision-guided munitions. A computer control group serves as the LGBs' front-end guidance system, while an air foil group with stability fins on the back of each weapon delivers lift and aerodynamic stability for in-flight maneuvering.

Lockheed Martin is a provider of the Paveway II LGB and all three variants of the Paveway II MK-80 series LGBs; is the sole provider of the Paveway II Enhanced Laser Guided Training Round and Dual Mode Laser Guided Bomb; and has delivered more than 55,000 LGB kits to the U.S. Air Force, U.S. Navy, and international customers.

Mine detection

Northrop Grumman delivered, by 11 March 2010 and roughly three weeks ahead of schedule, Low-Rate Initial Production (LRIP) lot 2 Airborne Laser Mine Detection System (ALMDS) pods to the U.S. Navy.

The ALMDS, mounted on the side of an MH-60 helicopter, detects and locates floating and submerged mines, which pose a threat to U.S. and allied military and commercial ships. In both day and night, the system uses pulsed laser light and streak tube receivers in an external equipment pod to image the near-surface volume area of the sea in 3D.

Northrop Grumman's Common Infrared Countermeasures (CIRCM) system is designed to protect warfighters against current and future IR missile threats.

SPECIAL REPORT

The Joint High Power Solid-State Laser (JHPSSL) program is designed to accelerate solid-state laser technology for military uses, including as weaponry.

The ALMDS will be coupled with Northrop Grumman's RAMICS, now in development. RAMICS, also operating from an MH-60S helicopter, will use the mine location information from the ALMDS, relocate the mine, and neutralize it with a 30-millimeter gun. Both systems are part of the Mine Counter Measures (MCM) Mission Package to be deployed on Littoral Combat Ships. Northrop Grumman also serves as LCS Mission Package Integrator for the Navy.

A hot topic

"Lasers produce an incredible amount of laser power to destroy their targets, but they also produce a ridiculous amount of heat," says Dr. Dan Rini, president of RINI Technologies in Oviedo, Fla. "They produce five to 10 times as much heat as they do laser beam power. They make a lot of heat is the problem," he summarizes.

The laser divisions of some large companies—such as Northrop Grumman, Textron, and Boeing—have developed "very powerful lasers that can shoot down missiles and burn holes in things," Rini explains. Current solid-state laser systems "are relatively compact, the size of a couple large office desks."

The laser system might be very compact, but the cooling system required is much bigger and can take up most of the airplane or ground vehicle upon which is to be deployed. "They can fit the laser on the airplane from a size and weight point of view," Rini says, "but the cooling system doesn't fit because the water chillers are extremely large. Instead of inventing this flying refrigerator to keep the laser cool, we have developed two technologies that solve two different problems."

In a nutshell, a laser will shoot at a target for a short period of time and then be off for a much longer period of time, Rini explains. "The laser only comes on for a short period of time but, during that time, it produces an incredible amount of heat," Rini notes. "We have thermal energy storage technology that can store the heat that the laser generates during those short bursts and then slowly rejects it through the aircraft's cooling system over a longer period of time, such as the time that it takes to fly to a new area.

"It has been developed through Technology Readiness Level 5; it has been proven in lab environments and interfaced with laboratory lasers, and it is ready to be integrated with a laser demonstrator when appropriate," Rini says.

RINI Technologies' second laser cooling innovation for directed-energy weapons gets inside the laser to cool the laser components with evaporative spray cooling. Spray cooling is conducive to a compact system. "Nobody wants a laser that is like a flying laboratory; they want a laser that is compact, lightweight, and efficient," Rini mentions. "Evaporative spray cooling can reduce the size and weight of the cooling systems by factors of 3 or 4.

"If you look at the whole laser system, the biggest, heaviest part is typically the cooling system; and when you want to fly it, put it on a Humvee, or put it in a military environment, you have to carry everything," Rini explains. The power supply typically comes in at a close second, and the laser is likely the lightest element. "So the power and the cooling are huge slices of the pie when it comes to the size, weight, and power of a laser system."

Northrop Grumman engineers, who produce the ALMDS at the company's Melbourne, Fla., facility, achieved the early deliveries with the teamwork of Naval Sea Systems Command PMS 495; the Naval Surface Warfare Center, Panama City Division, Panama City, Fla.; and the Defense Contracts Management Agency; as well as Areté Associates, Tucson, Ariz., which manufactures the Receiver Sensor Assembly; Cutting Edge Optronics, a Northrop Grumman subsidiary in St. Charles, Mo., which manufactures the high-powered laser transmitter; CPI Aero, Edgewood, N.Y., manufacturer of the pod housing; Curtiss Wright/DY4, San Diego, manufacturer of the central electronics chassis; and Meggitt Defense Systems, Irvine, Calif., which produces the environmental control system.

Northrop Grumman's Melbourne facility, the company's Center of Excellence for Airborne Mine Countermeasures, is under contract to develop the U.S. Department of Defense's four Airborne Mine Countermeasures sensor programs.

"The Northrop Grumman contractor team and our Navy partners are working hard to get these systems into the fleet as quickly as possible," says Dan Chang, vice president of Northrop Grumman Maritime and Tactical Systems. "ALMDS and the Rapid Airborne Mine Clearance System (RAMICS) are critical tools with demonstrated technologies for getting our warfighters out of minefields. These two programs are key to the fielding of the entire mine detection and destruction capability to our warfighters."

Northrop Grumman's Airborne Laser Mine Detection System can operate from U.S. Navy helicopters.

Laser reflections

The military has long reaped the benefits of laser rangefinders, target designators, and sensors on the battlefield. "They want to provide that to almost every platform and every soldier," says Nieuwsma. "They are looking to decrease the size, weight, and power (SWaP) so they can run on cell phone-style batteries. SWaP is the big push on the targeting end of lasers and we're working some advanced concepts with planar waveguide lasers to make very compact lasers to fill that niche for the military."

Compact and efficient, lasers are well suited to achieving SWaP goals. "Affordability is another big issue," says Byren. "The planar waveguide laser architecture, it turns out, is amenable to many different military applications: from the low-end, which includes laser rangefinders, all the way up to the high-end, directed-energy weapons."

Cooling is another major factor to consider in the design of modern, high-energy laser systems. "Advanced cooling technology is one of the gate keepers to deploying a high-energy laser on a small tactical aircraft," explains Dr. Dan Rini, president of RINI Technologies in Oviedo, Fla. Without adequate cooling, the laser just won't function: efficiency is lost, wavelengths are incorrect, and it can catastrophically fail.

"Standard cooling techniques work great in the lab," Rini continues, "but they don't necessarily transition well to military environments. You need advanced cooling techniques to make [laser systems] lighter and smaller."

Many technology firms are also working to advance ladar, or laser radar, for mil-aero applications. Raytheon is involved in a Defense Advanced Research Projects Agency (DARPA) program called SALTI, Synthetic Aperture Ladar for Tactical Imaging. "It is the first successful application of synthetic aperture radar techniques to optical frequencies," Byren enthuses. "It's a difficult job, and it was done successfully by Raytheon."

A true space-qualified laser, able to withstand the rigors of space for long periods, is another unanswered need. "Right now, there are some lasers in space, but typically lasers have problems in the absence of atmosphere and gravity, and in high radiation fields," Nieuwsma says. "Lasers that have been in space for NASA and others have had short lifetimes, shorter than desired."

Raytheon's laser operations take place in the company's calibration lab in El Segundo, Calif.

"The lack of atmosphere is an issue because of the potential for outgassing of contaminants. Radiation is an issue, and which orbital plane you're in determines how much radiation the system has to withstand. And the fact that you can't get up there and maintain a laser in space is a big deal," Byren admits, "it really has to be reliable and redundant in many ways."

Gravity is yet another challenge. "It is amazing how many subtle things depend on the presence of gravity," Nieuwsma says, "and you find out when you try and work without it."

TECHNOLOGY FOCUS

Steady as she goes

The space electronics market is moving steadily along while exploring smaller and smaller form factors to increase performance. Meanwhile, the methods for radiation-hardening electronics remain the same.

By **JOHN McHALE**

The economic downturn has affected many high-technology markets, but much like the military sector the space electronics market continues to prove resilient. Investment in new designs and new programs are steadily increasing and designers of radiation-hardened (rad-hard) electronics are optimistic midway through 2010 despite the recession and government cutbacks.

Programs that have been canceled the last few years include the Department of Defense's Transformational Satellite Communications System (TSAT) and most recently NASA's Constellation program, which includes the Ares 1 and Ares V rockets and the Orion crew exploration vehicle.

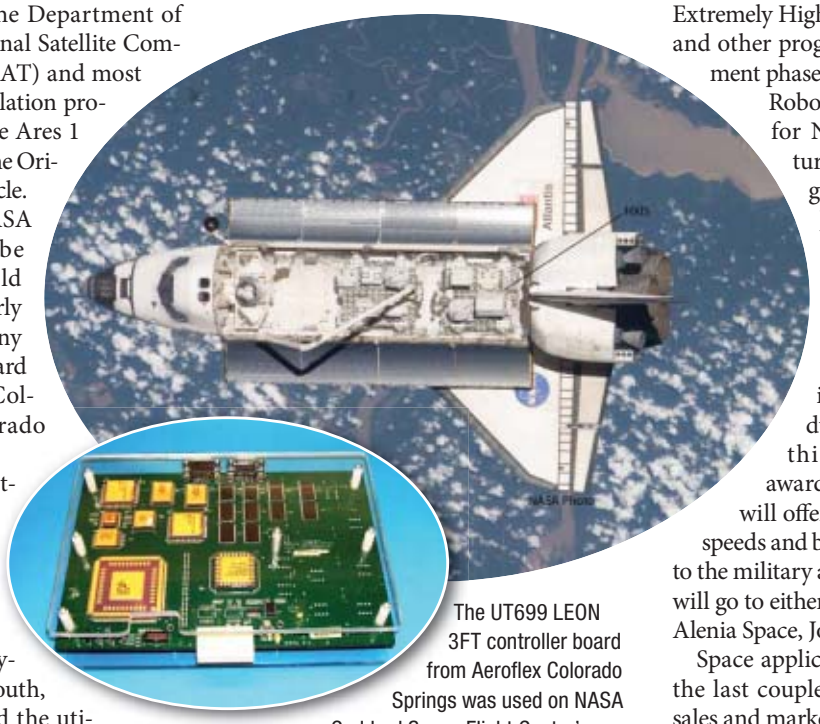
The cancellation of ASA Constellation could be troublesome but "should not manifest itself till early next fiscal year," says Tony Jordan, director of standard products, at Aeroflex Colorado Springs in Colorado Springs, Colo.

"Most new space platforms have been either cancelled or delayed," says Keith Nootbaar, senior director of microelectronics and precision sensors at Honeywell Aerospace in Plymouth, Minn. "This has delayed the utilization of Honeywell's newer technologies and products longer than we had anticipated. However, the first half of this year has seen several new space development programs being awarded, which has resulted in an increase in our 150 nanometer HX5000 ASIC (application-specific integrated circuit) implementations.

Honeywell, which is a major player in the Constellation program, is still moving forward as if the program will survive.

"Until a final budget is approved by Congress, it is inappropriate for Honeywell to speculate," Nootbaar says. "However, our work continues on Orion, and Honeywell is integrally involved in command and data handling systems, displays and controls, navigation, systems engineering, and software for the Orion crew exploration vehicle."

Space programs tend to survive because their design schedules stretch out for so long. "The space market is strong regardless of the economy because the timelines to design and build a satellite—sometimes more than five years—are much longer than a typical economic downturn," says Doug Patterson, vice president of sales and marketing at Aitech in Chatsworth, Calif. "Also, there are certain applications that always require space assets no matter what the economy is like such as TV broadcasting, mobile communication, imaging, etc."



The UT699 LEON 3FT controller board from Aeroflex Colorado Springs was used on NASA Goddard Space Flight Center's MISSE-7 (Materials International Space Station Experiment-7), which is a test bed for materials and coatings attached to the outside of the International Space Station.

Much of the recent space market turmoil could be in the past. "The market seems steady right now and we just came through a unique cycle, which was a result of TSAT being canceled and having the Advanced Extremely High Frequency (AEHF) satellite and other programs still in their procurement phases," Jordan says.

Robotic and deep-space missions for NASA are steady and "the turnover is pretty quick, which gives us buoyancy as well," Jordan notes.

Another program important to Aeroflex is GPS III, which will provide improved Global Positioning System (GPS) satellite navigation worldwide. The industry is also expecting good things once the contract is awarded for Iridium Next, which will offer improved satellite network speeds and bandwidth for cellular service to the military and other users. The contract will go to either Lockheed Martin or Thales Alenia Space, Jordan adds.

Space applications have been strong for the last couple years, says Greg Overend sales and marketing manager at MS Kennedy Corp. in Milpitas, Calif. The commercial arena has been driven by high-definition TV and the military by classified satellite programs such as GPS III, he adds.

The improving market conditions and new programs bode well for designers of rad-hard technology such as field programmable gate arrays (FPGAs), single-board computers (SBCs), memory, integrated circuits, power converters, and other devices.

TECHNOLOGY FOCUS

Rad-hard technology trends

"The latest trend in radiation-harden electronics is in the area of high-speed communications, especially for next-generation space applications," Nootbaar says. "The primary radiation hardened technology that is enabling this trend is Honeywell's serializer/deserializer (SERDES) product and technology that improves the speed of serial data communication fifty-fold over existing radiation hardened space electronics.

"This technology includes both a discreet quad redundant SERDES product and an imbedded application-specific integrated circuit (ASIC) macro," Nootbaar continues. "These SERDES product and macro allows for communications speeds up to 3.125 gigabytes per second per channel enabling standard communication protocols such as Gigabit Ethernet, 10 Gigabit Ethernet XAUI, and 10 Gigabit Fibre Channel XAUI.

"For space applications, we have seen high reuse of existing platforms requiring the need for older products," Nootbaar continues. "Because of this demand we have maintained our 0.8-micron and 0.35-micron products and processes. This has opened up new opportunities for Honeywell as 5-volt product becomes obsolete, especially for field programmable gate arrays (FPGAs). We have completed between 40 and 50 Actel FPGA replacements over the last five years with first pass success on all of the implementations. In addition, approximately one-third of these translations are flying.

"We are starting to see non-radiation hardened military applications seeking the the 5-volt compliant capability for older programs, especially with respect to ECL capable products," Nootbaar continues. "Honeywell has been able to develop a proven CMOS-based ECL I/O capability for these programs."

Aeroflex's focus today is with microprocessors, Jordan says. Aeroflex supplied a UT699-base LEON 3FT controller card to NASA Goddard Space Flight Center's MISSE-7 (Materials International Space Station Experiment-7). MISSE-7 is a test bed for materials and coatings attached to the outside of the International Space Station.

The UT699 LEON 3FT controller board used Aeroflex's UT699 LEON 3FT microprocessor along with memory, FPGA, and logic products—the UT8ER512K32 SRAM MCM with error detection and correction, the UT8R512K8 4-megabyte SRAM MCM, UT6325 Eclipse FPGA, and UT54ACS164245S logic. Two of Aeroflex's clock products, the UT7R995 clock buffer, and its new UT7R2XLR816 clock network manager, are also on board, Jordan says.

The company's acquisition of Gaisler Research in Goteborg, Sweden, has enabled it to develop microprocessor IP cores, he adds.

Rad-hard memory

In the rad-hard memory arena the main trend is toward larger densities.

The hermetically-sealed SVGA series of rad-hard point-of-load converters from VPT are characterized to 100 kilorad total dose radiation.

"Larger density SRAMs and non-volatile memories" are in demand among system integrators," Nootbaar says. "Honeywell has two product development programs to address these requirements. The first program, which is nearing completion, is the development of a 64-megabyte SRAM module. This product uses four of Honeywell's QML-qualified, 16-megabyte monolithic SRAMs and stacks them using a low-profile die stacking methodology to produce a 64-megabyte SRAM that is the same footprint as the 16-megabyte SRAM. Engineering models are available now, with QML qualified flight units available the second half of this year.

"With respect to high-density, non-volatile memory, Honeywell has a program to develop a 16-megabyte monolithic MRAM (magnetic resistive, random access memory) based upon our success with the 1-megabyte MRAM that is currently available. The 16-megabyte MRAM will read and write like an SRAM, will have radiation assurance of greater than 1 megarad total dose, and capable of maintaining data for greater than 15 years without refresh. Like the 16-megabyte SRAM discuss previously, Honeywell plans

COMPANY INFORMATION

Actel
650-318-4200
www.actel.com

Aeroflex
719-594-8000
www.aeroflex.com

Aitech
818-700-2000
www.rugged.com

ASIC Advantage
408-541-8686
www.asicadvantage.com

Atmel
408-441-0311
www.atmel.com

BAE Systems
703-361-1471
www.baesystems.com

C-MAC Micro Technology
44 1628 859 680
www.cmac.com

Crane Interpoint
425-882-3100
www.interpoint.com

Harris
800-4-HARRIS
www.harris.com

Honeywell
612-951-1000
www.honeywell.com

International Rectifier
310-726-8000
www.irf.com

Intersil Corp.
408-432-8888
www.intersil.com

Linear Technology Corp.
408-432-1900
www.linear.com

Maxwell Technologies
877-511-4324
www.maxwell.com

Microelectronics Research Development Corp.
719-531-0805
www.micro-rdc.com

Micropac Industries
972-272-3571
www.micropac.com

Modular Devices
631-345-3100
www.mdipower.com

MS Kennedy
315-701-6751
www.mskennedy.com

Peregrine Semiconductor Corp.
858-731-9400
www.psemi.com

Radiation Assured Devices
731-531-0800
radiationassureddevices.com

Semicoa
714-979-1900
www.semicoa.com

STMicroelectronics
41 22 929 29 29
www.st.com

Synova
321-728-8889
www.synova.com

Teledyne Microelectronic Technologies
310-822-8229
www.teledynemicro.com

3D-Plus
214-733-8505
www.3d-plus.com

Triad Semiconductor
336-774-2150
www.triadsemi.com

Ultra Communications
760-652-0011
www.ultracomm-inc.com

VPT
425-353-3010
www.vpt-inc.com

Xilinx
408-559-7778
www.xilinx.com

to stack this product to create a 64-megabyte MRAM module for FPGA load applications. We are working with major SRAM-based FPGA manufacturers to ensure the design and communication structure is in alignment with their product requirements."

Honeywell's newest memory product is the "4 Megabyte Rad-Tolerant SRAM—with 300krads total dose," Nootbaar says. "This is a new product developed by Honeywell that leverages our 150 nanometer process capability along with our silicon on insulator (SOI) process technology to provide a low-priced, 4-megabyte SRAM product for the larger market that does not need or can afford a 1 megarad product."

The 4-megabyte RT SRAM provides access times of 15 nanoseconds (12 nanoseconds typical) at approximately 25 percent of the price and 20 percent of the active power of Honeywell's 0.35-micron 4-megabyte SRAM, he adds.

Rad-hard power ICs

Users of rad-hard power integrated circuits (ICs) are looking for improved performance, higher power density, smaller size, lighter weight, and added functionality, says Odile Ronat, HiRel marketing manager at International Rectifier Corp. in El Segundo, Calif. "They sometimes have to place the power converter on the digital board to meet performance requirements."

This presents a new challenge for the power designers and digital designers alike where they have to combine their designs on a single board where very little space is left for the power converter, which requires "a whole new level of integration and power density for the power designer," Ronat continues. End users are beginning to understand that they "will need to make some changes from the proven designs and heritage so that they can achieve their new design goals by leveraging new solutions under development by their suppliers.

"The hottest market shift is a huge demand for rad-hard, point-of-load converters that can be used in conjunction with traditional isolated rad-hard DC-DC converters

The M3G rad-hard DC to DC converters from International Rectifier are used in space applications.

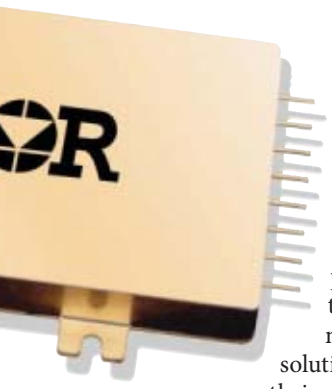
to support high efficiency distributed architectures," says Daniel Sable, president, of VPT Inc. in Everett, Wash. "Using point-of-load converters instead of standard DC-DC converters throughout a system saves size, weight, and dramatically improves efficiency and therefore thermal designs are simplified. All these are critical issues for spacecraft. This technology is very mature for commercial applications, but there have been few offerings of high efficiency, non-isolated, rad-hard point-of-load DC-DC converters for use in space applications."

VPT offers the hermetically sealed SVGA series of rad-hard, point-of-load converters, which steps down voltage at the point of use and is characterized to 100 kilorad total dose radiation, Sable says. The SVGA point-of-load converters are designed and manufactured in a facility qualified to ISO9001 and certified to MIL-PRF-38534 Class H and Class K and MIL-STD-883, he adds.

Challenges in power level and power density also continue to vex radiation-hardened power designers, Ronat says. "As satellite power is increasing, power management with increasing currents becomes more complex. To overcome the weight and power losses of higher current systems, several architecture changes are under consideration or in development such as higher bus voltage and distributed power architecture.

"Higher bus voltages have the potential of reducing power losses by reducing the current," Ronat continues. "It also has the potential of reducing the weight of the electrical harness. On the other end of the spectrum, digital integrated circuits operate at lower and lower voltages as newer digital technology are introduced into space applications. This is addressed by distributed, multi-stage architecture with an intermediary bus and point of load converters which require new level of controls and performance."

International Rectifier's M3G RAD-Hard DC-DC Converters are used in space application and the company also offers radiation hardened power MOSFET, diodes, Schottkys, MOSFET driver, voltage regulators, and solid-state relays for space and military applications, Ronat says.



Outsourcing die packaging

Rad-hard die designers at Linear Technology in Milpitas, Calif., find that they provide a more cost-effective solution by outsourcing their packaging needs to hybrid packaging experts such as MS Kennedy, says Rafi Albarian, manager for space and harsh environment products at Linear. Linear also works with Aeroflex in Plainview, N.Y., and Radiation Assured Devices in Colorado Springs, Colo. Albarian says outsourcing is the most efficient method with hybrids as they are very complicated designs. In the past companies such as MS Kennedy might buy die from Linear and then integrate the package themselves, he adds.

Now the die manufacturer controls the integration process, which provides more confidence to end-users that the die they are purchasing will be reliable, Albarian continues.

Rad-hard, single-board computers

Engineers at Maxwell Technologies in San Diego design single-board computers for space applications in naturally occurring environments, and their users are "looking for moderate total dose performance, high reliability, high processing performance, fast data throughput, a large user memory, and very high resistance to single event upsets," says Larry Longden, senior director of marketing and technology at Maxwell Technologies. "It takes a long time to reboot a board that has had a non-recoverable upset. Also, with a single processor board the user must wait to find out that an unrecoverable upset has occurred."

In Maxwell's SCS750 SBC, "every single processor upset is automatically corrected with no user intervention and every non-recoverable upset is detected immediately," Longden says. "In addition, due to our radiation mitigation the probability of a non-recoverable upset is very low, much lower than any single processor system."

Users get an increased design margin that gives them "the ability to handle growth in system requirements and the natural growth of software as it is developed without changing the design," Longden adds.

Designers of single-board computers for space are under the same power versus performance pressures that designers of boards for terrestrial applications.

"Today, commercial off-the-shelf (COTS) rad-hard processor products have settled on the need for higher-performance computing with the ability to support dynamic power reduction, or the scaling back of power during idle and low computing utilization while on-orbit to extend battery life," Patterson says. "Many applications have determined that the very high single event upset rate offered by less expensive, non-point design COTS products are sufficient for the most demanding high Earth orbit and deep space programs.

"We currently have five products that can support 100 kilorad tolerance with a minor

substitution change of components," he continues. "The near future is our 100 kilorad S960 PowerPC-based 3U CompactPCI single-board computer."

COTS products also require upscreening at times. "It is encouraged for low-cost LEO systems," Longden says. "The qualification cost to use a plastic part is still very expensive."

"In general, we're finding that component quality is dropping, therefore upscreening has become an absolute necessity as more device fallouts are found," Patterson says. "With the addition of counterfeit issues, upscreening or 100 percent component testing of parts has become a service in high demand these days and a natural extension of our value proposition."

Making it rad-hard

While new products and geometry sizes populate the radiation-hardened electronics world, the methods for radiation-hardening the components remains largely unchanged.

"I think the methods for hardening have not changed," Maxwell's Longden says. "For space environments products are developed using a combination of radiation hardened, radiation tolerant, upscreened military and commercial products. Total dose performance is achieved by part selection and shielding. Single event performance is achieved by part selection for latchup and system level mitigation techniques for upsets. For military systems with weapon environments it is still dominated by the use of radiation hardened semiconductors."

The methods for radiation hardening have not really changed much the last few years as we work down toward smaller form factors, Jordan says. The two methods remain rad-hard by design and rad-hard by process, he adds.

"Radiation hardening needs to be done by process, design, or a combination of both depending on the technology and product so it is a very specialized and complicated development process that is mastered only by a few companies," Ronat says. "Improved design tools and manufacturing process control are making product development easier and faster, but significant challenges remain as the manufacturing of these products and ensuring reliability continues to require significant testing and exacting controls."

"Radiation hardened by process is still the only demonstrated method for achieving the full range of radiation hardened program requirements," Nootbaar says. "Honeywell would anticipate hardening by process to continue to be the method at least through 90 nanometer development. Programs continue to adapting commercial technologies using redundancy at the circuit and chip level.

"Beyond 90 nanometers, where the cost of capitalizing a 65 nanometer wafer fab or smaller is extremely high compared to earlier geometries, radiation hardening by design such as triple redundancy voting will most likely be the most accepted method," Nootbaar says. "This will not provide the strategic hardness that is required by some applications, and therefore 90 nanometer and 150 nanometer radiation hardened by process will continue to be utilized for these critical applications. In addition, radiation hardened by design will lose some of the geometry benefits with respect to power and density due to the redundancy and will effectively be equivalent to one generation earlier technology."

For example, 65 nanometer radiation hardened by design would be equivalent to 90 nanometer radiation hardened by process for power and density, he continues. "Therefore, it is believed that

PRODUCT INTELLIGENCE

Military demands for smaller, lighter connectors may push changes in longstanding military specifications

By **JOHN KELLER**

Power and data connectors for aerospace and defense applications are shrinking in size and weight in response to demand for soldier-mounted electronics, unmanned vehicles, and other applications where small size and weight are solid requirements.

The problem, however, involves longstanding military specifications—particularly for the standard military circular connectors that link electronics boxes to other boxes or devices. These mil-spec MIL-DTL-38999 circular connectors resist the effects of shock and vibration, salt spray, dust and dirt, as well as moisture and humidity, yet increasingly they are too large for some of the military's smallest platforms.

"Most people not in this business take a look at systems electronics, and all they see are big circular connectors, which weigh enormous amounts," says John Binder, military and aerospace industry manager at connector designer Hypertronics Corp. in Hudson, Mass. "Those circular connectors do have great shock-and-vibe capability, but you are using up so much weight and real estate that eventually those will have to be replaced. You need to design to mil standards, but how do you change the mil standards?"

Binder points to the newest generations of unmanned aerial vehicles (UAVs) as prime examples of applications that are driving electronic and electro-optical connector technology. "Unmanned vehicles are where it starts to change," Binder says. "You don't want a lot of hardware to keep these in place, like thumb screws and bolts, but the mindset of the manned aircraft engineer hasn't hit that yet. This whole process of where UAVs are going is really going to change dramatically how aircraft are built in the future."

Institutional change in the military connector industry will come slowly, he cautions. "It won't happen overnight; this has been the standard for about 50 years," Binder says. "In five years, we might see it."

Hypertronics specializes in small, rugged connectors that link components inside subsystems boxes. Its flagship product is a hyperboloid contact shaped like a basket of wires. Each wire is a conductor, and together these wires grab and hold connector pins to prevent problems from shock and vibration. The company also is designing larger box-to-box connectors based on the hyperboloid approach that may help drive changes in connector mil-specs in the future.

The military's growing need for small, lightweight, and rugged connectors is driving developments at Fischer Connectors in Alpharetta, Ga. The company has introduced the LandForce connector, as part of its UltiMate military connectors, which withstand nuclear, biological, and chemical environments and are designed for soldier systems where size and weight are critical.

When it comes to power connectors, one company is trying to re-invent the aircraft interconnect to reduce the potential for misconnects and other reliability issues. Custom Electronics Inc. in Oneonta, N.Y., is using bus-bar interconnects to replace hundreds of power connectors on military aircraft. On the V-22 tiltrotor aircraft alone, Custom Electronics bus-bar switches have replaced up to 260 conventional power connectors, says Ken Brandmier, director of product development at Custom Electronics.

COMPANY INFORMATION

AbelConn LLC
763-533-3533
www.abelconn.com

Accel Connectors Inc.
951-296-9435
www.accelconnectors.com

Advanced Interconnections Corp.
401-823-5200
www.advanced.com

AirBorn
972-931-3200
www.airborn.com

American Conec Corp.
919-460-8800
www.conec.com

American Micro Products Inc.
800-479-2193
www.american-micro.com/connectors.asp

Amphenol
877-267-4366
www.amphenol.com

AVX Corp.
843-448-9411
www.avx.com

BTC Electronic Components Inc.
919-556-8900
www.btcelectronics.com

C&K Components
617-969-3700
www.ck-components.com

Cinch Connectors
630-705-6000
www.cinch.com

Concord Electronics Corp.
212-777-6571
www.concord-elex.com

Connector Technology Inc.
732-745-2880
www.connectech.com

Custom Electronics Inc.
607-432-3880
www.customelec.com

DA-Green Electronics, LTD.
732-254-2735
www.dgecorp.com

Delphi Connection Systems
949-458-3100
http://connectors.delphi.com

Delta Electronics Manufacturing Corp.
978-927-1060
www.deltarf.com

Endicott Interconnect Technologies Inc.
866-820-4820
www.eitny.com

Ericsson Inc.
972-583-2372
www.ericsson.com

FCI
+33 (0)1 39 49 21 83
www.fciconnect.com

Fischer Connectors Inc.
678-393-5400
www.fischerconnectors.com

Glenair Inc.
818-247-6000
www.glenair.com

Harwin Inc.
603-893-5376
www.harwin.com/

Hypertronics Corp.
978-568-0451
www.hypertronics.com

Interconnect Devices Inc. (IDI)
913-342-5544
www.idinet.com

ITT Interconnect Solutions
714-557-4700
www.ittcannon.com

kSARIA Corp.
978-933-0000
www.ksaria.com

LEMO USA Inc.
707-578-8811
www.lemousa.com

Martec Limited
+44 (0)1227 793 733
www.martec.ltd.uk/

Molex Inc.
630-969-4550
www.molex.com

OFS
860-678-0371
www.specialtyphotonics.com

Omnetics Connector Corp.
763-572-0656
www.omnetics.com

Sabritec
949-250-1244
www.sabritec.com

Spectrum Control Inc.
814-474-1571
www.spectrumcontrol.com

SV Microwave Inc.
561-840-1800
www.svmicrowave.com

Tempo-Textron
760-598-8900
www.tempo.textron.com

TTI Inc.
817-740-9000
www.ttiinc.com

Tyco Electronics Aerospace & Defense
717-564-0100
www.tycoelectronics.com

W.L. Gore & Associates
410-392-4441
www.gore.com/

OPINION

Advancing technology enlists new MIL-COTS power solutions

By **KEITH NARDONE**

The Pentagon is challenging industry to reduce development time and cost. To meet delivery and budget goals, there are fewer opportunities for new development items. The shift is toward field-proven commercial off-the-shelf (COTS) components with configuration flexibility. This keeps cost down while meeting delivery expectations and with the lowest possible risk.

To look at one area, the need for tactical intelligence has had a place in warfare for as long as wars have been fought, but asymmetric warfare—with the bad guys intermingling with the populace—intensifies that need. Commanders in the field have always tried to optimize their situational awareness but they had precious little ability to do much about it.

Now, the relentless advancement of technology has provided some ability for commanders to gain real-time insights 24/7. Such tools as unmanned aerial vehicles (UAVs) are gathering surveillance imagery that helps to find and neutralize insurgents and, perhaps equally important, identify those who legitimately live and work there. But technology brings more than the UAV itself, which might be carrying video cameras or other electronics for communication, navigation, and weapon control. There are more compute-intensive electronics on the ground, including ruggedized monitors, computers, and communications equipment.

Although the requirements of each electronic device or system are different—fast delivery, light weight, unique packaging, heat and noise management, low voltages, high currents, fast transient response, high efficiency—they all need MIL-COTS power.

UAVs, which have been characterized as the biggest change on the battlefield since the introduction of gunpowder, can weigh a pound or so and be held in a hand or have a wingspan of about 50 feet. They are designed to fly at altitudes of 2,000 feet or as high as 50,000 or even higher; some can remain in the air for days. They may be fixed-wing or helicopters, yet most important from a power point of view is the payloads they carry.

In the air, the power solutions are dictated by the requirements of the onboard electronics, which could include an onboard computer for image processing, autopilot, data acquisition/analysis, control actuation; sensors like GPS receiver, gyroscopes, accelerometers; transceivers; and cameras like infrared, thermal imagers, low-light TV cameras, and video cameras. Power requirements likely include MIL-COTS 28-volt DC input (MIL-STD-704) with output of perhaps plus-or-minus 5 volts for inertial sensors, 3.3-volt DC for computers and GPS); and 12-volt for transmitters. Power could be in the range of tens to hundreds of watts.

In general, whether a MIL-COTS system is in the air or on the ground, reduced size, weight, and power (SWaP) is the order of the day. With smaller UAVs, small and lightweight are more than the order of the day; they're crucial. MIL applications, of course, have to be rugged and able to withstand severe environments, including shock and vibration and very high and low temperatures. In Afghanistan temperatures, for example, can range from about -50 to 110 degrees Fahrenheit.

Proximity of the power train to the load can be a significant issue. Several electronic systems likely to be collocated on a UAV suggest the need for filtering to manage the conducted noise and radiated noise. Shielding is a consideration when electronics are in close proximity to one another. With several devices on a UAV, for example, busing might be needed. With 28 volts to be distributed the current can be high. That means larger traces or system distribution losses could become significant. Using small, power-dense devices to perform the voltage transformation and current multiplication at the point of load mitigates this issue.

On the ground, the parameters driving the power requirements shift to high-performance, compute-intensive imaging and analysis capabilities. The ground control station, which might incorporate a virtual cockpit and even be remotely located in the United States; certainly includes computers, displays, and communications.

Although ruggedness and small size remain desirable, the power solution now must provide such capabilities as high power density and fast transient response. While new multi-core technologies not only offer increasing computer power and produce more work per watt, the power needs of a ground control station are substantial.

Just introduced early this year to great fanfare in the MIL-COTS community, the Intel Core i7 processor is already being used in many MIL-COTS applications for image processing. Each time a new processor architecture or technology is introduced, it typically requires different conditions than prior processors. In this case, power supplies must meet the requirements of the VR12 design guidelines, a standard that dictates response time, trim range, the amount of droop that can occur, and many other parameters. The Core i7 processor will go into a sleep mode when there's no processing needed, and when it instantaneously wakes up, power must be there ready to go. Clearly, with such a processor, fast transient response from the power supply is absolutely essential.

An input voltage of one volt or so for the processor core is still demanding. If, however, the power supply must be a distance away from the processor, overcoming the inductance becomes challenging at the levels of current involved. Again, having current multiplication/voltage transformation at the processor relieves these issues.

New MIL-COTS power solutions are available to support such advanced technologies as those represented by UAVs and their ground systems, and they are small, light weight, rugged, low noise, highly efficient, and provide fast dynamic response. Specifically, for example, power solutions based on V-I Chips can more easily be designed because they are small (1/16 and 1/32 brick footprints), light weight (0.5 ounce), rugged (encapsulated), 95 percent efficient, and operate in temperatures from

Steady as she goes from page 30

the next-generation technology beyond 90 nanometer would be radiation hardened by design at the 45 nanometer process node."

"Radiation-hardening of DC-DC converters consists of a combination of component selection, circuit worst case analysis, and radiation testing at both the component and converter level to verify the required performance when exposed to the space environmental conditions," VPT's Sable says. "A strict, well-defined test plan is paramount to the success of the product development plan.

"The radiation hardness verification consists of determining parameter degradations through piece part radiation testing and applying them to the circuit analysis," Sable says. "The final converter design is then radiation tested to ensure that the converter parameter degradations can be explained by the component level degradations. For example, the impact of the shift in input offset voltage and current of an operational amplifier used in the current limit circuit should show up as a predictable shift in output current limit in the converter over radiation. It is also important that measurements are made at several radiation levels during the component level and converter level tests because some parameter degradations are not monotonic and therefore may not be worst case at the design radiation level.

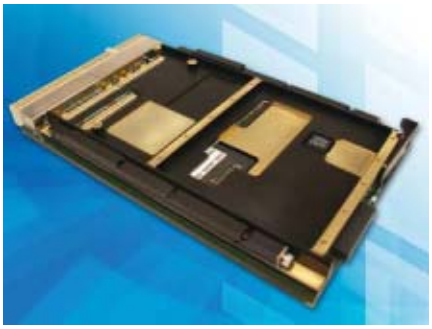
Opinion from page 32

-55 to 125 degrees Celsius, and have 1-microsecond transient response.

Another advantage that these devices bring to military applications is the robustness of the design. They withstand enormous amounts of shock. The interconnect systems are very rugged. Because the regulation and isolation are split into two devices, they can be physically located in different sections of the end use, distributing the thermal load more efficiently and allowing for weight distribution.

Nevertheless, design engineers will continue to pack more electronics into smaller places. This will continue to challenge the power industry to reduce size and weight while increasing power density and efficiency.

Keith Nardone is director of aerospace and defense business development at Vicor Corp. in Andover, Mass.



The S950-02 from Aitech has a total ionizing dose resistance greater than 15 kilorads.

"The design of enhanced low dose rate sensitivity (ELDRS) free converters can require long test cycles due to the fact that the time to reach the test dose level can be several months," Sable notes. "This has increased both cost and schedule for product development for space products, however its value to the long term reliability of the mission is critical."

Development times are longer not only because of the radiation-hardening aspect especially with FPGAs, Patterson says. "The development time is actually taking longer because of the additional features that now must be built in the FPGA design as the development of the FPGA code is becoming more complicated. This is due in part to having more FPGA gates and more features which are being added. Many times, deliveries can be shortened as Aitech has refined its manufacturing process and tailored it to respond to small and large quantity orders simultaneously."

Enhanced low dose rate sensitivity

"A major industry concern the past few years has been enhanced low dose rate sensitivity (ELDRS)," says Leonard Leslie, manager, space programs at VPT. Designs must not show ELDRS, which is "caused by components degrading earlier when exposed to a dose rate closer to that seen in the application, as opposed to high dose rates traditionally used for design qualification," he adds.

The high dose rates of greater than 50 rads per second "used for testing rad-hard devices historically may be a flawed method for many of the user's applications," Leslie notes. "A low dose rate of less than 10 megarads per second may provide a more reliable predictor of actual tolerance in many applications.

"Some extreme reliability applications VPT supports, such as the GPS III program, also need custom designs that have enhanced requirements in addition to total ionizing dose and single event upset tolerance, he says. "These requirements include increased component screening and hardening for special environments that may be far in excess of even the typical stringent space component levels.

PRODUCT APPLICATIONS

AIRCRAFT COMMUNICATIONS

Rockwell Collins to provide secure airborne voice, data, and video communications for top U.S. government officials

Airborne communications systems designers at Rockwell Collins Inc. in Cedar Rapids, Iowa, will provide sophisticated aircraft communications equipment for the vice president of the United States, congressional leaders, and other high-ranking government personnel under terms of a $208.9 million contract.

The U.S. Air Force Electronic Systems Center (ESC) at Hanscom Air Force Base, Mass., is asking Rockwell Collins to provide the Senior Leadership Command, Control, and Communications System-Airborne Communications system, which gives secure voice, data, and video capability to the Very Important Person Special Air Mission (VIP/SAM) fleet of aircraft based at Andrews Air Force Base, Md.

Rockwell Collins will provide secure voice, data, and video equipment for as many as 40 VIP/SAM aircraft, such as the C-20B (Gulfstream III), C-32A (Boeing 757), C-37A (Gulfstream V), and C-40B (Boeing 737) fixed-wing aircraft.

The Air Force is hiring Rockwell Collins to provide communication system operator workstations; passenger stations Voice over Internet Protocol phones; video teleconferencing systems; classified and unclassified local area networks; and training, maintenance, and logistic support.

The Senior Leader Command, Control, and Communications System—Airborne Communications Program, referred to as SCP, provides on-aircraft communications for VIP/SAM users, who typically are U.S. senior leaders traveling worldwide who must be able to carry out their official duties while away from their home offices.

This equipment provides reliable and secure voice, data, and video equipment, as well as common user interfaces and communications management functions across the VIP/SAM aircraft fleet.

For additional information, visit the Air Force ESC online at www.hanscom.af.mil/esc, or visit Rockwell Collins at www.rockwellcollins.com.

COMMUNICATIONS AND NETWORKING

Juniper Networks powers training and experimentation network for U.S. Joint Forces Command

Leaders of the U.S. Joint Forces Command (JFCOM) in Norfolk, Va., needed a core-to-edge military network that provides real-time joint simulation and training to Army, Navy, and Air Force personnel around the globe. They found their solution at Juniper Networks Inc. in Sunnyvale, Calif.

Juniper routers, switches, firewalls and network security, and event management solutions are powering the JFCOM Next-Generation Joint Training and Experimentation Network (NextGen JTEN), which supports as many as 30,000 concurrent multicast streams with a mix of live video and virtual battle simulations for several users and events around the world.

JTEN is the military communications network for the U.S. Department of Defense Joint National Training Capability (JNTC), and helps train combatant commands and services through live and virtual means. The rapidly reconfigurable network supports joint training exercises, experimentation, and the evaluation of battle management concepts.

Juniper is providing JFCOM with MX240 Ethernet services routers, advanced routing, such as low-latency multicast, MPLS network virtualization, advanced QoS, IPv6, and security.

Juniper Networks EX4200 Ethernet switches, with virtual chassis technology, combine the high availability and carrier-class reliability of modular systems with the flexibility and economic advantages of stackable platforms.

Juniper Networks ISG2000 Integrated Services Gateways provide firewall, Virtual Private Network (VPN), and integrated Intrusion Prevention System (IPS) solutions with multi-gigabit performance, a modular architecture, and extensive virtualization capabilities.

JFCOM is using features of the MX Series, EX Series, and ISG Series to deliver, segregate, and secure several multicast events for several customers. The next-generation multicast has the Juniper Networks Junos operating system and was implemented to improve multicast performance without slowing transmissions and causing minimal CPU degradation common in other approaches.

For additional information, visit Juniper Networks online at www.juniper.net, or Joint Forces command at www.jfcom.mil.

AVIONICS

Electronic flight bag software from Teledyne Controls chosen for Freebird Airlines Airbus jetliners

Officials of Freebird Airlines in Istanbul, Turkey, needed software applications to run on the electronic flight bag (EFB) hardware installed in the charter carrier's fleet of Airbus A320/A321 jetliners. They found their solution from Teledyne Controls in El Segundo, Calif.

For their electronic flight bag software, Freebird chose Teledyne's Flight Manager, which provides an integrated operating system for the software suite; Document Viewer, Performance Tool; Weight & Balance; Forms Viewer; and the ground-based LRU Configuration Manager (LCM), which helps with bi-directional electronic data transfer between airborne EFBs and ground systems to access and manage important documents on the flight deck.

Teledyne's EFB software applications are designed to streamline Freebird's flight deck operations and facilitate information exchange between onboard EFBs and back office, ground-based networks.

"Teledyne's wide range of applications enables us to do more than just manage documentation electronically," explains Captain Auke van Ginkel, the performance manager and EFB administrator at Freebird Airlines.

"We are gaining more functions, such as aircraft performance calculations, weight and balance calculations, an anti de-icing tool, text messaging, and we can transfer software upgrades and navigation databases from our ground station to our EFBs

with the LCM application," van Ginkel says.

For additional information, visit Teledyne Controls online at www.teledynecontrols.com, or Freebird Airlines at www.freebirdairlines.com.

SURVEILLANCE AND RECONNAISSANCE

U.S. Navy selects BAE Systems-led team to provide intelligence, surveillance, reconnaissance, and targeting system

A BAE Systems-led team will partner with the military to develop the U.S. Navy's primary intelligence, surveillance, reconnaissance, and targeting (ISR&T) system. Under a $72 million contract from PEO C4I PMW 120, the team will enhance the current version of the Distributed Common Ground System-Navy, and continue to transition DCGS-N to an application-based system through the DCGS-N Prime Mission Product.

Making ISR&T data visible, accessible, and understandable across services, DCGS-N is part of the Department of Defense's DCGS family of systems and integrates ISR&T support capabilities into a Web-enabled, net-centric, and interoperable enterprise.

DCGS-N uses commercial and government off-the-shelf hardware, software, tools, and standards to build a scalable, modular, and extensible multisource intelligence system that is interoperable with other DCGS systems, describes a company official.

"DCGS-N is a successful program that has achieved its Full Deployment Decision. We look forward to working with BAE Systems on near-term capability upgrades as we align towards the CANES architecture," says Capt. Robert E. Parker, program manager for PMW 120.

In addition to BAE Systems, the team includes General Dynamics, Sun Microsystems, MTCSC, Space Dynamics Laboratory, InVisM, Argon ST, and Athena Consulting. As a DCGS-N Block 1 contractor, BAE Systems participated in the system's development and operational evaluation aboard the USS Harry S. Truman.

"An integrated system will enable the Navy to maintain information dominance in any battle space by accelerating its ability to exchange information and data across multiple security domains, warfare areas, environments, and theaters," says John Jarman, vice president and general manager of defense systems and solutions for BAE Systems. "With this award, we will

PRODUCT APPLICATIONS

continue working with PEO C4I and the fleet to improve information sharing within the Navy, other services, and the intelligence communities."

BAE Systems will perform the work at its command, control, communications, computing, and intelligence development centers in San Diego and Charleston, S.C.

COMMUNICATIONS EQUIPMENT

Rugged communications router from Parvus chosen for NATO MEADS anti-ballistic missile system

Missile defense systems integrators at Lockheed Martin Space Systems Co. in Littleton, Colo., needed a rugged integrated services router (ISR), to provide the

network connectivity for the NATO medium extended air defense system (MEADS) anti-missile system. They found their solution from Parvus Corp. in Salt Lake City.

Parvus officials will provide the company's DuraNET 3825, a ruggedized version of the Cisco Systems 3825 ISR, to Lockheed Martin for the MEADS tactical operations center.

Lockheed Martin Space Systems is providing battle management and command, control, communications, computers, and intelligence capability for the NATO MEADS.

With mechanical packaging enhancements designed to suit shipboard and military shock and EMI environments, the DuraNET 3825 is designed to meet MIL-S-901D grade B shock levels and MIL-STD-461 radiated emissions requirements.

Under development by Germany, Italy, and the United States, MEADS is a mobile system that will replace the U.S. Patriot and Italian Nike Hercules anti-ballistic missile systems. It will replace Hawk and Patriot missiles in Germany.

The DuraNET 3825 combines Cisco IOS software, Catalyst Layer 2 LAN switching, and Layer 3 WAN routing into one ruggedized platform.

This Internet Protocol (IP) networking device integrates embedded security processing, memory capacity, and interfaces for the NATO MEADS.

The DuraNET 3825 subsystem comes in a rugged rackmount 2U chassis fitted with circular MIL-DTL-38999 connectors. The unit brings as many as 19 Ethernet and 10 serial ports, including dual Gigabit Ethernet WAN uplink ports, a Gigabit Ethernet Switch port, 16 10/100 Ethernet switch ports, eight asynchronous/synchronous RS-232 ports, console, and auxiliary serial ports.

For additional information, visit Parvus Corp. online at www.parvus.com, or Lockheed Martin Space Systems at www.lockheedmartin.com/ssc.

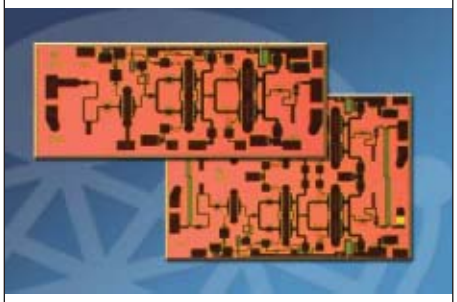
NEW PRODUCTS

To submit new products for consideration, contact John Keller by e-mail at jkeller@pennwell.com

RF AND MICROWAVE

GaAs pHEMT power amplifier MMIC die for military microwave applications introduced by Hittite

Hittite Microwave Corp. in Chelmsford, Mass., is introducing two GaAs pHEMT-based power amplifier MMIC die for military, microwave radio, SATCOM, automotive radar, medical, and sensor applications from 24 to 29.5 GHz. The HMC863 is a three



stage GaAs pHEMT MMIC 1/2 watt power amplifier that operates from 24 to 29.5 GHz and provides 26 dB gain and 28 dBm saturated output power at 18 percent power added efficiency (PAE). This high linearity amplifier also delivers high output IP3 of +38 dBm, while consuming only 375 milliamps from a 6-volt power supply. The HMC863 power amplifier can also be operated from a 5-volt supply, offering as much as 26.5 dBm saturated output power. Also released is the HMC864 three stage GaAs pHEMT MMIC 1 watt power amplifier that operates from 24 to 29.5 GHz with 26 dB gain, and 31 dBm of saturated output power at 18 percent PAE. The HMC864 consumes 750 milliamps from a 6-volt supply, while delivering +29 dBm output P1dB, and 40 dBm output IP3. This amplifier can also be operated from a 5-volt supply, providing as much as 29.5 dBm saturated output power. The RF inputs and outputs of the HMC863 and HMC864 power amplifiers are DC blocked and matched to 50 Ohms for ease of integration into multi-chip-modules (MCMs). Both amplifiers are rated for operation from -55 to 85 degrees Celsius, and require no external matching components. For more information, visit Hittite online at www.hittite.com.

EMBEDDED COMPUTING

Computer module with Intel Atom processor introduced by Portwell for embedded military applications

Portwell Technology Inc. in Fremont, Calif., is introducing the PQ7-M103XL Qseven (Q7) open-standard computer module based on Intel Atom processor and companion PQ7-C100XL 3.5-inch ESB form factor developer carrier board for low-power, wide-temperature and fanless military, industrial control, and medical applications. The PQ7-M103XL is based on the open standard Qseven form factor measures 70 by 70 millimeters, has the Atom Z510PT 1.1 GHz or Z520PT 1.33 GHz

microprocessor, and Intel System Controller Hub (SCH) US15WPT. The embedded computer module operates in temperatures from -40 to 85 degrees Celsius, and supports two SATA ports, and as many as three PCI Express x1 lanes, dual independent display via LVDS and SVDO, an onboard NAND Flash, and industrial-grade Gigabit Ethernet. For more information, visit Portwell Technology online at www.portwell.com.

DATA BUSES AND NETWORKING

Rugged Ethernet switch for harsh-environment use in military vehicles introduced by GE

GE Intelligent Platforms in Charlottesville, Va., is introducing the GS12 rugged Ethernet switch for harsh-environment applications in military ground vehicles that need the ability to interconnect many nodes. The GS12 improves information distribution speed, accuracy, and security, GE officials say. The stand-alone managed Layer 2/3 Gigabit unit combines 12 Gigabit Ethernet

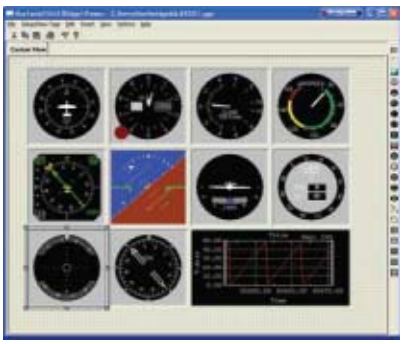
ports with support for IPv6 switching and routing in a small, lightweight enclosure. Additional management and configuration features include quality of service (QoS) prioritization, VLANs, LAG, SNMP, RSTP, VRRP, IGMP, and traffic policing. The device measures 2.5 by 6.5 by 9.25 inches, weighs four pounds, and operates in temperatures between -40 and 75 degrees Celsius. The GS12 Ethernet switch is for applications in military and aerospace ground, airborne, and naval environments. Connections to the conduction-cooled GS12 are made via the rugged front panel, which meets MIL-STD-810F requirements for humidity, salt spray and dust. For more information, visit GE Intelligent Platforms online at www.ge-ip.com.

TEST AND MEASUREMENT

MIL-STD-1553 databus analyzer software introduced by GE Intelligent Platforms

GE Intelligent Platforms in Charlottesville, Va., is introducing version 7 of the company's BusTools-1553 bus analyzer software for analyzing, testing, and simulating data traffic on the MIL-STD-1553 databus. BusTools-1553 version 7 is an integrated Windows-based application that uses GE Intelligent Platforms hardware interfaces on PCI, CompactPCI, PCMCIA, PC/104, PC/104-Plus, PC/AT, VME, and VXI platforms. BusTools-1553 v7 is available for use with 1553 avionics products from GE Intelligent Platforms, and provides existing users with a straightforward migration path. It also provides support for converting the data files. "The avionics market is moving away from character-based bus analyzers in favor of more intuitive, GUI-based solutions that are much easier to use," says

NEW PRODUCTS



Ben Daniel, business manager for avionics at GE Intelligent Platforms. For more information, visit GE Intelligent Platforms online at www.ge-ip.com.

AVIONICS TEST

Portable flight-line radio altimeter test set for manned aircraft and UAVs introduced by Aeroflex

The Aeroflex Inc. Test Solutions Group in Wichita, Kan., is introducing the ALT-8000, the RF-based portable radio altimeter flight line test and measurement set, a portable simulator for testing radio altimeters installed in aircraft and unmanned aerial vehicles (UAVs). The ALT-8000 lightweight universal test set, which is for 4.3 GHz frequency modulated continuous carrier wave (FMCW) radio altimeters and pulse radio altimeters, has a 12-inch color touch screen. The ALT-8000 may be directly coupled to the radio altimeter transmitter/receiver (TX/RX) ports or may be connected via supplied TX/RX antenna couplers, which accommodate most aircraft antenna variants. RF simulation of radio altitude from -100 feet to +50,000 feet (+/- 1.5 foot accuracy) is provided and altitude rate may be set to provide a

smooth ramping altitude simulation to verify decision heights and altitude trips, for auto-land systems and altitude data feed to enhanced ground proximity warning systems (EGPWS). As many as three ALT-8000 test sets may be linked via an altitude sync line for executing 2- or 3-channel coordinated altitude simulation for dual or triple installation auto-land system testing. For more information, visit Aeroflex Test Solutions online at www.aeroflex.com/ats.

PRODUCT & LITERATURE SHOWCASE

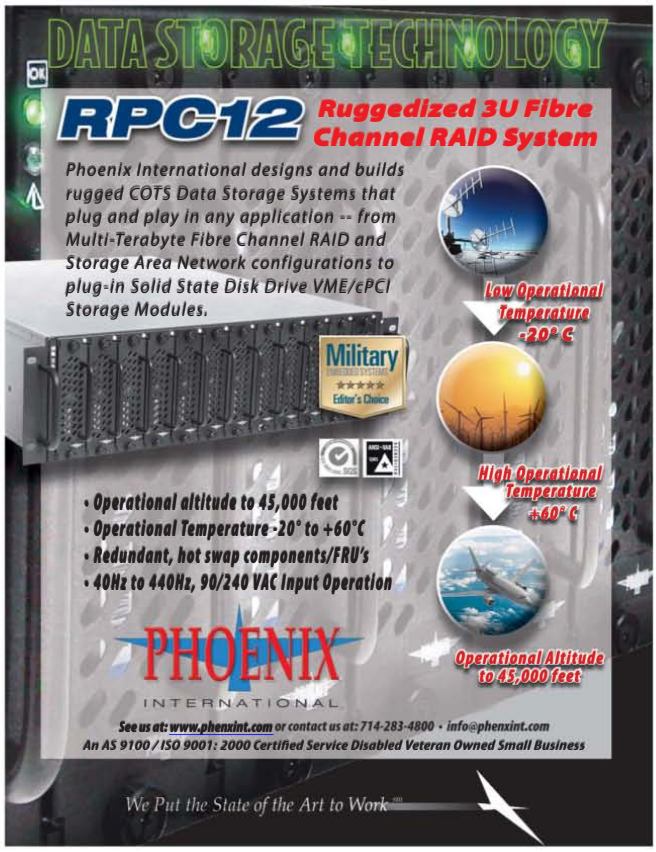
PRODUCT & LITERATURE SHOWCASE

ST-9020 rugged computer system with 20" display, MIL STD shock & vibration qualified

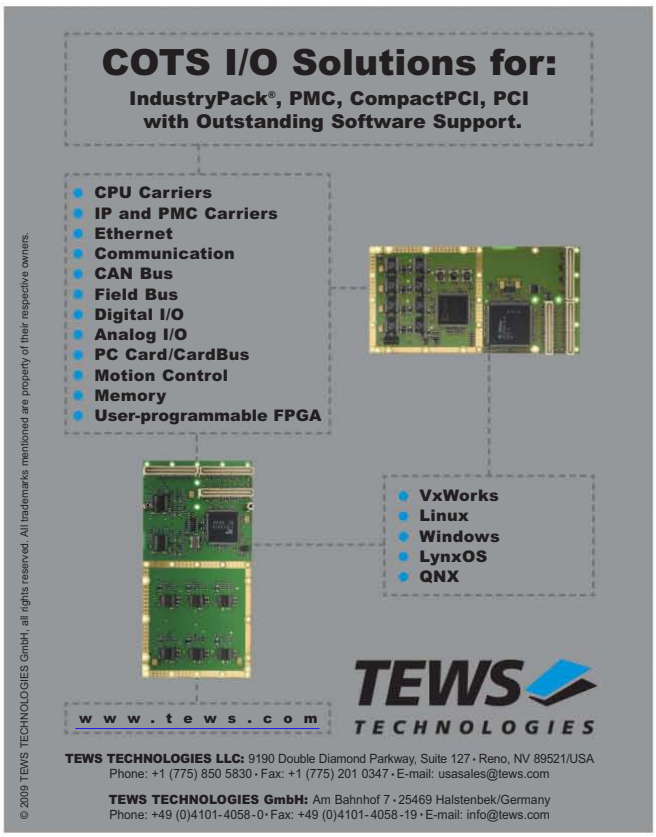
DU-19/U rugged monitor

For full line of rugged systems contact:

IBI SYSTEMS, INC.
6842 NW 20TH AVE, FORT LAUDERDALE, FL 33309
PHONE; 954-978-9225, WEB: www.ibi-systems.com



ADVERTISERS INDEX



MILAERO.COM

Military & Aerospace Electronics

Best of the Web

MILAERO BLOG

Going back in time on the USS Cassin Young

The line was too long to get on "Old Ironsides"—the USS Constitution—in the Charlestown Navy Yard in Boston, so a friend and I checked out the World War II destroyer, the USS Cassin Young instead. What a treat. We were fortunate enough to bump into an amateur historian and member of the National Park Service onboard the Cassin Young named Bob Harris. He gave us a personal tour of the ship, the highlight being the Combat Information Center or CIC right across from the captain's quarters. Today, the command center of any naval vessel is all digitized, very different than the time capsule we stepped into that Saturday. Today, navigation, radar, etc. are all processed on state-of-the art displays with super fast embedded computing—while on the Cassin Young charts marked by hand adorn the walls and table tops.

more www.militaryaerospace.com/index/blogs.html

DEFENSE EXECUTIVE

DARPA seeks to develop sensor networks able to detect threats in densely populated cities

Intelligence processing experts at the U.S. Defense Advanced Research Projects Agency (DARPA) in Arlington, Va., are asking industry to develop sensor networks to detect threats in densely populated cities from imaging sensors and other sources. DARPA issued a broad agency announcement (DARPA-BAA-10-49) for the Wide Area Network Detection (WAND) program, designed to provide information processing to help detect and localize threats in cities where they are difficult to differentiate from the civilian population. The WAND program will include automated sensor processing to detect, identify, localize, and track threats in vehicles and on foot by combining wide area motion imaging (WAMI) and other sources of data; combine the information with human intelligence and other information to estimate threat networks; and manage sensing resources to best advantage.

more http://bit.ly/a98r5H

AVIONICS INTELLIGENCE

Low-altitude UAV market to remain strong over next five years

Image courtesy U.S. Air Force.

Low-altitude unmanned aerial vehicles (UAVs) will dominate growth in the combined low- and high-altitude UAV market over the next five years, with growth in demand for low-altitude UAVs expected to post a 20 percent annual growth rate, according to market analysts at Market Intel Group LLC (MiG) in Colorado Springs, Colo. The high-altitude UAV market, meanwhile, will stagnate over the next five years, with an accumulated annual growth rate of only 4 percent, MiG analysts predict. High-altitude UAVs such as Predator, Reaper, and Heron variants fly at altitudes of 15,000 to 30,000 feet.

more www.avionics-intelligence.com

COMMAND POST COMMUNITY

Boeing comments on WTO's decision on Airbus subsidies

Boeing issued a statement following news reports about the U.S. case against European subsidies to Airbus: "This is a powerful, landmark judgment and good news for aerospace workers across America who for decades have had to compete against a heavily subsidized Airbus. U.S. officials have estimated the commercial value to Airbus of all the government launch aid subsidies it has received at more than $178 billion (in 2006 dollars). Government subsidies have been used to support the creation of every Airbus product, including the A330/A340, which received more than $5 billion in development aid, and the A380, which received $4 billion in subsidies. Those and other European government subsidies to Airbus have significantly distorted the global market for large commercial airplanes, causing adverse effect to Boeing and costing America tens of thousands of high-tech jobs."

more http://community.milaero.com